Since it was established in 2013, the Korea Green Growth Trust Fund has activated over one hundred and twenty programs in over sixty countries around the world. Funded by the Ministry of Strategy and Finance of South Korea, at a total of $88 million USD through 2021, and managed by the World Bank Group, the trust fund supports results-driven programs that combine development goals with environmental and socio-economic sustainability. To date over forty of these programs are linked to all support $13 billion USD in World Bank lending and other co-financing facilities such as ADB, AIIB, GCF and GEF.

Building on this success, the trust fund will continue working in collaboration with World Bank client countries to facilitate green growth programs across the urban, transport, ICT, energy, environment, water, agriculture and climate sectors. Many of its programs are multi-sector, integrating two or more sectors at both the planning and implementation stages. This provides opportunities that allow for cost savings, data collection, citizen engagement and new forms of transparency and governance.

Knowledge sharing and network building are an integral part of green growth implementation. Facilitating the sharing of green growth best practice and technical expertise through on-site learning, and through the development of practical learning tools is part of what makes the Korea Green Growth Trust Fund unique.

This Portfolio Book spans seven years of KGGTF funded programs worldwide. It is organized by sector and region, identifying the country and scale of expected impact (municipal, regional, national or global level) as well as the technical components of each program.

Information on this booklet is correct as of October 2019. Please see page 180 for the list of abbreviations.
**Mexico** is implementing policy reforms to reduce GHG emissions. The World Bank’s work with the Government resulted in the decision to phase out fossil fuels subsidies and introduce a carbon tax.
CLIMATE PLANNING

GLOBAL
2 PROGRAMS
One challenge facing all World Bank projects is how to make decisions in a world constantly in flux. When long-term investment choices are being made, how can shifting variables such as climate change, politics, and social upheaval be factored in? Infrastructure investments last for decades, therefore a badly planned investment can have costly consequences over the long term.

Historically, decision analysis has relied on point and probabilistic predictions. For years, engineers and investors have taken into account a wide range of variables: wind speed, water levels, and temperature fluctuations among other factors when planning and designing roads, bridges, energy plants, water dams and all other types of infrastructure. Their calculations, based on previous meteorological data, typically stayed within clearly identified ranges.

But now, due to climate change, weather patterns no longer follow predictable patterns. The result? Traditional projections are no longer reliable. Many locations once free from flood, typhoon or hurricane risks are now impacted regularly by extreme weather. The past is therefore no longer a predictable guide for the risks of tomorrow.

How does a road planner choose between investing in larger culverts and elevating roads or in its place increasing maintenance? Perhaps neither of those is a good solution and instead constructing secondary roads is a more cost-effective option that will ensure alternative access if a main link is destroyed. In many cases establishing flexibility in the design of the project—while initially a greater up-front investment—reduces future costs and ensures investment success. A method for evaluating uncertainty and factoring it into investment decision-making processes would allow governments and investors to reduce potential risks and make more robust long-term investments.
Implemented Around the World

The DMDU method being deployed across multiple sectors and situations in 11 countries around the world.

- **Transport**
  - Peru
  - Mozambique
  - Bangladesh
  - Tanzania
  - Dar es Salaam
  - Lake Victoria

- **Energy**
  - Turkey
  - Nepal
  - Bangladesh

- **Flood Risk Management**
  - Ho Chi Minh City
  - Colombo

- **Water Management**
  - Lima, Peru
  - Mexico City
  - Lake Victoria

- **Planned Projects**
  - Kenya, Flood Protection
  - Nepal, Hydro-electric
The World Bank Group and KGGTF support a multi-year program to develop a comprehensive methodology for Decision-Making Under Deep Uncertainty (DMDU) to assist bank staff and the World Bank’s clients during the selection of investment in situations of high uncertainty.

This methodology focuses on what can be done, exploring the objectives and choices that are available, rather than on what could happen, opening the door to a myriad of possibilities that cannot be predicted and agreed on. During the DMDU analysis, different strategies that explore future threats as well as opportunities possibly confronting each plan are “stress-tested”. This is done by analyzing the economic performance of a strategy across a wide range of potential conditions that could include: extreme climate fluctuations, increased traffic, population growth and migration, or the vulnerability of the particular link. Identifying the most acceptable economic returns – whatever the situation – allows for robust investment and infrastructure decisions.

This methodology helps bank staff and its clients to understand what could be the possible failures of each decision and then agree on a solution that everyone is comfortable with. Failure here means the expected underperformance of the options in some scenarios. People will not necessarily agree on one option for the same reasons, but most of the time, even with different values and beliefs, acceptable solutions can be agreed upon.

DMDU is part of green growth and supports decision makers successfully navigate a host of variables. Sector integration and continually factoring in the long-term social and economic impact of a project are key ingredients to building resilient and sustainable infrastructure and ensuring project success.
TRUST FUND IMPACT

With KGGTF support, this decision-making tool was piloted and validated for use in six World Bank lending projects in water, flood management, and hydropower, and in 10 World Bank lending projects in the transportation sector, including ongoing efforts in Mozambique, at Lake Victoria, and in India. In Colombo, Sri Lanka, the analysis demonstrated that wetland conservation was the most economically efficient solution for the city to reduce flood risk, and it contributed to the creation of a Wetland Management Unit within a government agency. In Peru, the analysis recommended a water supply investment masterplan to the Lima water utility and it is now being implemented. In Mozambique, the tool that was developed for road prioritization in two provinces will soon be used by the road agency to prioritize investments across the entire country.

These methods are now being deployed across multiple sectors and situations in 11 countries and integrated as a foundational World Bank framework to help standardize and manifest more robust and resilient infrastructure investments worldwide.

CASE STUDY

Prioritization of Road Intervention in Nampula and Zambezia, Mozambique

Road networks in the Nampula and Zambezia districts of Mozambique are disrupted by recurrent flooding. Resulting in economic hardship for citizens.

Prioritization of Districts Based on Criticality for the Economy and on Flood Risk

With an objective to improve rural accessibility and agriculture production in these districts, a tool was created to determine where investment is most needed and which type of intervention will have the highest impact. The tool prioritizes districts where transport investments should yield the highest benefits, and assist in selection of the most robust combinations of investments.
In Uganda climate change is causing extreme weather events such as flooding and droughts. KGGTF is working with Uganda to build analytical tools to support smart environmental decision making.
WATER
Turning Kenya’s Water Utilities Green

**PROGRAM GOAL**
Support the Government of Kenya to mainstream green growth concepts into the Water and Sanitation Development Project and the national sanitation initiative.

Kenya is facing critical water supply and sanitation challenges due to pollution, depletion of water resources, and ongoing drought. The Water and Sanitation Development Project (WSDP) was set up with World Bank financing to improve water supply and sanitation services by investing in water infrastructure. The national sanitation initiative focuses on improving key sanitation indicators, in particular by eliminating open defecation practices in rural communities and improving sanitation conditions in dense urban settlements.

These two programs are designed to support the devolution process of water and sanitation service provisions. They are the foundations of improving public health, environmental conditions and economic growth in strategic regions throughout Kenya.

This KGGTF funded program will operate at the county and national levels to support both of these flagship projects. It will do this by providing advisory services and knowledge activities to support the application of green growth principles into the WSDP, and to mainstream city wide inclusive sanitation into the Government of Kenya’s national sanitation initiatives. The program will fund knowledge exchange activities, such as workshops, conferences and study tours to foster information sharing among institutions in Kenya and learn from real and practical experiences conducted in client countries and Korea.
Building Drought Resilience in the South of Angola Using Geospatial Information and Nature-based Infrastructure

**PROGRAM GOAL**
To help the Government of Angola (GoA) and the World Bank develop a program of well targeted interventions to enhance water security and drought resilience.

Multi-year drought in South Angola is causing significant difficulties that, depending on the year, affect over 76% of the local population. Some areas in the region recorded the driest season in 35 years. Among the most pressing problems are malnutrition, family abandonment, deepened lack of resources, deforestation, and increased risk of local conflicts. The economic impacts of those setbacks for all sectors are estimated at over US $749 million, with the agriculture-livestock-fisheries sector being the worst affected.

This World Bank KGGTF grant will help to get a better understanding of the spatial patterns of surface and groundwater supply and use. It will facilitate the involvement of the communities in the monitoring, management and maintenance of the water sources. It will also help to identify sites with potential for the implementation of enhanced shallow groundwater recharge in wadis or low-lying areas.

The activities funded by this grant will result in more resilient communities in the face of climate variability and drought, and an increase in nature-based infrastructure solutions at the community level. This grant will also help with enhanced regional maintenance and repair capabilities by improving information flow, boosting competitiveness, and focusing on the private sector.

This activity will also provide the GoA with an opportunity to improve coordination of interventions from different donors and maximize the efficiency of development aid.
Development Climate Resilience Capacity in Water, Environmental & Civil Infrastructure

PROGRAM GOAL

Establish a capacity building program to support the training of a generation of experts in the ability to analyze and manage Uganda’s water and environmental systems. These skills will include the integration of climate resilience and the analytical tools recently created to support smart environmental decisions.

For over a decade the Government of Uganda (GoU) has undertaken reforms aimed at making Integrated Water Resource Management (IWRM) the foundation for water sector management and development. As part of the reforms, an appropriate policy and institutional framework for IWRM, including regulatory, planning and development has been established. Whilst there is some expertise to support this effort, crucial capacity gaps remain, including the need to address emerging issues such as the increasing significance of climate change that is leading to higher occurrences of extreme weather events such as flooding and droughts. This requires integration of climate risks and opportunities into the planning and designing of Uganda’s development programs and infrastructure, which requires specific skills set currently not available in country.

This KGGTF program will support the design of applied training modules that will be used to build a cadre of skilled champions in key infrastructure sectors including energy, urban, transport and water. Firstly, funds will be used to undertake an institutional and training needs assessment of the water and climate sectors in Uganda, and the design of an institutional framework for establishing a Water Resources and Climate Resilience Institute to meet the increasing capacity development needs in the sector. Key training modules will then be developed in partnership with relevant global institutions such as the Korean Water Academy (K-Water), IHE-Delft in the Netherlands and MIT in the U.S. to be used in the training of government practitioners across key sectors. Training modules will be developed in line with needs identified from the training needs assessment.
Quantifying Tradeoffs between Water and Energy Investments in Morocco

**PROGRAM GOAL**

To promote global knowledge through the Green Growth Knowledge Platform, providing a water-energy nexus toolkit to help integrate water and energy resource planning.

Morocco is leading by implementing green growth principles. This program is facilitating knowledge exchanges between the water and the energy sectors, advocating globally and regionally for optimizing energy-water interdependency. Drawing from international experience in China, Korea, and South Africa, this program will develop models, a series of technical tools, and policy materials and guidance that will assist planners, energy specialists, and the private sector to integrate energy-water planning into green growth plans. The program will assess economic and social tradeoffs in Morocco resulting from water, energy, and power expansion, and will demonstrate the importance of integrated planning of energy, food, and water investments. The program will contribute to global knowledge through the Green Growth Knowledge Platform, providing a water-energy nexus toolkit to help integrate water and energy resource planning.
Central Asia Water Resources Management

**REGION**
Europe and Central Asia

**COUNTRIES**
Tajikistan, Kyrgyz Republic, Uzbekistan, Kazakhstan, Turkmenistan

**SCALE OF IMPACT**
Regional

**TECHNICAL AREAS**
IWRM, Open Data

**KGGTF PROGRAM YEAR**
3

**STATUS**
Completed

**PROGRAM GOAL**
To secure green growth in Central Asia through better water-resource management.

Two of Central Asia’s major rivers—the Amu Darya and Syr Darya—provide over 90% of energy supply in Tajikistan and the Kyrgyz Republic through hydropower. They support irrigation further downstream, helping the economies of Uzbekistan, Kazakhstan, and Turkmenistan stay afloat. However, poor water management has led to the salinization of up to 90% of agricultural land in these countries and caused a destitute and dry Aral Sea.

Funding for phase one of this multi-phase program will be used to investigate effective management and rational use of the waters, which are fundamental to the livelihood, and health of nearly 70 million people. Through analysis, institutional strengthening, and investment identification in the water and energy sectors in Central Asia, the focus of this program will transform the information, institutions, and investments for better water management in the region, increasing accessibility and reliability of water resources.
Greening Cities through a Water-Centric Urban Planning Approach

**PROGRAM GOAL**

Support the government of Colombia develop inclusive green growth policies.

Due to limited information the team will first focus on developing base information on solid waste management and urban water and sanitation in Guapi and Tumaco. The baseline information will be used for environmental and social assessments, technical studies, and economic analysis.

This green growth implementation program aims to integrate elements of the urban water cycle (water supply, sanitation, storm water management, and waste management) with both urban development and river basin management to maximize economic, social and environmental benefits for the cities. As a result, the program will develop a roadmap for sustainable urban water resource management, including an evaluation process to identify priorities and use a detailed cost-benefit analysis, for other Latin American countries.
Smart Water in Colombia

**PROGRAM GOAL**
Fund the creation of two flagship smart water projects to promote efficiency in service delivery through demand management, more efficient supply systems, resource recovery from wastewater facilities, and comprehensive watershed planning.

The first project, the Rio Bogota Wastewater Program, will evaluate technical and financial approaches, including a private-public partnership, for the construction of a major wastewater treatment facility. The second project, the Plan Todos Somos Pazcifico located in the cities of Tumaco and Guapi in the Pacific South territory, will provide advisory services on demand management, energy efficiency, low-cost sanitation solutions for stilt houses, and ultimately a sustainable, climate resilient urban planning approach for water utility sector reform and urban water management.

These projects align with the Water Partnership Program, which provides global support for the adoption of integrated urban water management strategies across World Bank projects.

In *Increasing urbanization* in both emerging and advanced nations is stressing water supply. Urban water management systems can transform the way cities manage water by reducing water loss and improving efficiency, water conservation, and customer service.
Non-Revenue Water (NRW) project for Santa Fe Province – Argentina

**PROGRAM GOAL**

To provide technical advisory services and capacity building to the province of Santa Fe in Argentina. This is in order to obtain implementable and bankable high impact infrastructure projects through the IFC Sustainable Cities program.

In Latin America and the Caribbean region, approximately 37 million people lack access to safe drinking water, and almost 110 million do not have access to sanitation in the area. Particularly in Santa Fe, Argentina is subject to risks of extreme climatic events including storms, floods, frosts, and droughts, which affect the country’s population as well as its economy.

Alongside these circumstances, there is consistent flooding that affects Santa Fe and other provinces. To help address this issue, this KGGTF grant will fund the IFC’s LAC Sustainable Cities program, which will promote public and private sector investments of resilient urban infrastructures in the Santa Fe province, under green growth mainstreaming.

Providing support for the Cities Program in Santa Fe demonstrates a strong World Bank - IFC collaboration with both teams complementing each other’s work. At national level, the World Bank is also focusing efforts on pushing institutional reforms to strengthen the water sector across the country. Additionally, this program is closely linked with KGGTF partners, such as KECO and K-WATER, to share their vast experience in water developments; including construction, operation, and management of water facilities.
Learning from Korea’s Green Growth Experience to Tackle Environmental Health Challenges

REGION
Global

SCALE OF IMPACT
Global

TECHNICAL AREAS
Pollution Monitoring (Air, Water), Hazardous Waste Management Monitoring

KGGTF PROGRAM YEAR
5

STATUS
On-going

PROGRAM GOAL
Institutionalize knowledge of green growth so that World Bank staff and client countries can develop and incorporate green growth principles into their development strategies.

This KGGTF program will build on the partnership and ongoing collaboration between the World Bank Group’s Global Solutions Group on Environmental Health and Pollution Management, the Environment and Natural Resources Global Practices, and the Korean Ministry of Environment and its affiliated agencies to develop a series of multi-lingual online learning courses. Developed from global case studies, the courses will strengthen capacity to design and incorporate green growth initiatives and policies throughout the World Bank.

The initial online courses will be self-paced and built around environmental health and pollution management and will demonstrate how to identify new policies and investments. Furthermore, the course will provide a toolkit for identifying, designing, implementing, monitoring and evaluating environmental health policies. The courses will further present key interventions to address environmental health risks that affect vulnerable groups such as women, children, and the economically disadvantaged, along with solutions to engage multi-stakeholder groups and encourage public participation. An accompanying manual will further provide best practices and solutions for addressing air, water and soil pollution.
The dissemination of best practices will facilitate a better understanding of how green growth can provide a flexible approach for improving environmental and urban challenges while concurrently building shared economic prosperity.

An additional component of this program will help client countries identify new policies and investments to promote green growth, and further identify financing resources to support development, including other international financing institutions and co-financing opportunities along with the private sector.

In the heart of downtown Seoul runs the Cheonggyecheon River. One of the world’s greatest urban design projects: until recently a congested elevated freeway belching smog throughout the city. Now transformed, the previous freeway, is now an urban oasis and attracts over 60,000 visitors a day. The area has further catalyzed economic development.
PROGRAM GOAL
Provide technical and capacity building tools for countries, construction companies, and suppliers to build and implement green construction projects.

This program will provide tools to support government agencies design, contract and construct environmentally sustainable infrastructure projects.

FIRST COMPONENT
Develop tools to assist governments real-time project management. IT tools will track a project’s environmental, health and safety (EHS) project data. Along with performance, compliance and risks. The systematic tracking will enhance real-time decision-making. Field components will include checklists, monitoring, results documentation and tracking. Data monitoring, project tracking and EHS reporting will be web-based and accessible by smart phones and laptops.

SECOND COMPONENT
Development and implementation of a series of e-learning courses and capacity building activities for governmental agencies, the construction industry, SME’s and local workers and providers associated with World Bank finance projects. Courses will address key aspects of green infrastructure design, construction and sustainable infrastructure procurement.

THIRD COMPONENT
Identity materials, technologies and equipment (MTE) that can lead to sustainable infrastructure. Key MTE solutions will be compiled and disseminated to promote knowledge transfer and exchange.

Once these IT tools are developed they will be deployed across other World Bank projects.
Greener Cement Industries in Sub-Saharan Africa

PROGRAM GOAL
Make the production of cement more energy efficient and competitive, while better managing urban waste.

Rapidly urbanizing countries in Sub-Saharan Africa, which is expected to be home to 90% of the total African population by 2050, rely heavily on cement to build houses and infrastructure. Unfortunately cement production is generally energy-intensive which results in increased greenhouse gas emissions and air pollution. At the same time, urban waste generation is expected to increase by more than 440,000 tons per day by 2025. By leveraging the increased waste from cities and turning it into fuel, this World Bank KGGTF-funded green growth implementation program aims to support green growth by reducing the amount of fossil-fuel consumption associated with making cement. The program will find alternative fuel sources, including non-hazardous industrial waste and domestic trash, for the more than 70 cement facilities in the region. The change in energy source could reduce production costs and environmental and health impacts currently associated with urban growth in the region.
West Africa Fishery Partnership for Competitiveness and Sustainability

PROGRAM GOAL
To stem the tide of illegal catches in West African fisheries.

Fisheries are a $3-billion-a-year business in West Africa, employing more than 3 million people and providing up to 50% of the total animal protein intake for a number of countries in the region. But with dramatic illegal catches, estimated at up to 45% of the legal catch, or $1.3 billion annually, fish stocks and food security remain at risk. This World Bank, KGGTF-funded green growth implementation program will create efficient and effective, regionally connected monitoring and surveillance systems that will help coastal communities grow green economies and improve the health of fish stocks. The program will test an affordable and effective surveillance strategy, upgrade marine vessel monitoring and information systems, and include knowledge sharing with Korean Ministry of Oceans and Fisheries and their technical institutes, and South American and South East Asian counterparts. By consolidating and promoting sustainable and productive uses of renewable marine resources, in addition to building on improved fisheries governance, the region will not only prepare for projected climate change impacts, it will also unlock growth that benefits poor and vulnerable populations and helps restore West African economies.
Egypt Air and Water Pollution Management Program

PROGRAM GOAL
To curb air and water pollution and grow a green economy.

Every year in Egypt, up to 20,000 people die prematurely because of air pollution. The majority of pollution results from burning of agricultural and municipal waste, transportation sources, and industry. Water pollution is a growing concern as industrial effluent; agricultural fertilizers, pesticides, organic materials and untreated sewage damage the water, thus hindering economic growth and the cost of public health.

This World Bank KGGTF funded green growth implementation program aims to curb air and water pollution by improving access to sanitation and sewage treatment and limiting agricultural run-off and the burning of waste. An economic inquiry will assess the cost of environmental degradation in Egypt. Subsequent environmental analysis will identify pollution sources, and supports the government to prioritize effective policy reforms. The end result: enhanced rural agricultural incomes, improved health, and a country ready to face impending water shortages.
Building Climate and Disaster-Resilient Mediterranean Coasts: The Case of Tunisia and Morocco

PROGRAM GOAL
To provide activities, increase investment in priority areas, and identify policy reforms that will benefit coastal resilience in Tunisia and Morocco.

The rise in sea level and increasing coastal storm surges has contributed to the degradation of coastal areas in Morocco and Tunisia. The continuous increasing of coastal erosion is predicted to intensify the strain on coastal areas, thus requiring coastal management.

This KGGTF grant will support activities that address priority concerns in the coastal areas of Morocco and Tunisia, including innovation in coastal modeling. This action will further support sustainable financing as the preferred approach. Ultimately, this will enhance and strengthen the national capacity to integrate climate resilience into development planning, as well as scale and leverage climate resilience investments, whilst supporting ongoing initiatives.
Developing Integrated and Green Solutions for Municipal Solid Waste Management in Kazakhstan

**PROGRAM GOAL**

*To cover 100% of the population with adequate solid waste management service by 2030 and recycle 50% of the waste stream by 2050.*

Kazakhstan’s solid waste management system is not keeping up with the country’s rapid growth. It is estimated that 97% of the municipal waste generated ends up in uncontrolled dumps and landfills that do not meet environmental and sanitary standards. And only 3-5% ends up being recycled. Additionally, waste transportation vehicles are old and inadequate, which makes the collection process manually labor intensive and inefficient.

This World Bank KGGTF funded green growth implementation program aims to build an integrated and efficient national solid waste management system in Kazakhstan as part of recent green growth and waste management strategies. Policy recommendations will include suggestions for tariff and fee structures, possible subsidies, innovative solutions for recycling, including food-waste digesters, and strengthening public-private partnerships. With these types of investments, green jobs and green growth can flourish.
Action on Circular Economy for Green Growth in Uzbekistan and Kazakhstan

**REGION**
Europe and Central Asia

**COUNTRY**
Uzbekistan and Kazakhstan

**SCALE OF IMPACT**
Regional

**TECHNICAL AREAS**
Long-term GG Planning, Green Growth Macro Policy, Solid Waste Management

**KGGTF PROGRAM YEAR**
7

**STATUS**
On-going

**PROGRAM GOAL**

*To facilitate actions on the circular economy to achieve green growth in Uzbekistan and Kazakhstan.*

The proposed activity will support the development of Circular Economy Action Plans and green finance concepts in selected sectors in Uzbekistan and Kazakhstan in relation to regulatory reforms and institutionalization, stakeholder involvement, and frameworks for monitoring progress. This activity will also support necessary analytical work on the circular economy, providing practical guidance tools for World Bank staff and partner countries, introducing circular economy principles in policy and investment, as well as supporting policy dialogue and knowledge transfer.

Moving from a linear to a circular economy is an irreversible, global mega trend towards green growth (GG), and is closely tied with key priorities in Uzbekistan and Kazakhstan, including jobs, green finance, climate and energy, the social agenda and industrial innovation, as well as global efforts aimed at sustainable development.

The circular economy will also boost both countries’ competitiveness by protecting businesses against the scarcity of resources and volatile prices, helping to create new opportunities and innovative, more efficient ways of producing and consuming goods. It will create local jobs at all skills levels and introduce opportunities for social integration and cohesion.

This KGGTF funded activity, with technical support from Korean institutions and other co-financing, will also advance the transfer of knowledge to other selected countries at the global level.
Towards Green Growth of Baku: Enhancing Quality of Life through Sustainable Cleanup of Polluted Lakes

PROGRAM GOAL
To support the Government of Azerbaijan in its efforts to introduce green solutions for addressing legacy pollution, and for sustainable redevelopment of contaminated areas of selected Absheron lakes.

The economy of Azerbaijan is dominated by oil production and industry. Currently the industrial sector contributes over 60% to its GDP, and crude oil accounts for over 90% of its goods exports. Pollution associated with the oil sector has had severe effects on many locations at the Absheron Peninsula – the center of the oil production area – leaving the region damaged and caused significant land contamination. Land degradation is a deterrent to future development, and pollution’s impact on public health is significant.

The KGGTF funded program will focus on studying the area in and around Lake Khojasan, and will contribute to the identification of the cleanup and ecological revitalization measures of the water body and adjacent land in a sustainable and cost-effective manner. It further aims to foster a strong partnership between public and private sectors by developing innovative financial mechanisms for land redevelopment that could be scaled up and sustained in the future. Another component of the program will be to strengthen the capacity of involved stakeholders through the introduction of new technical know-how, and education and training in the deployment of green growth practices. This component will be carried out through studying, learning and sharing Korea's successes in green urban development, remediation of industrially contaminated sites and treatment of polluted water.
Sustainable Hydropower in Bhutan, Nepal, and Pakistan

PROGRAM GOAL

Advise policymakers across energy, water, and forestry sectors about the multiple benefits of smart hydropower planning and infrastructure.

As Himalayan countries face climate variability and search for energy solutions to green growth, hydropower is emerging as an efficient and resilient alternative. Hydropower already supplies nearly 85% of global renewable resources for electricity, and the addition of smart planning and infrastructure in countries like Bhutan, Nepal, and Pakistan can reduce greenhouse gas emissions and provide revenue streams through the sale of electricity.

One obstacle to hydropower efficiency is sediment inflow. By supporting local governments with technical capacity building and analysis of integrated watershed catchment area management, this KGGTF program will educate policymakers on the benefits of smart hydropower.

Integrated, well thought out systems can improve sediment retention upstream, reducing costly maintenance downstream. This type of planning and infrastructure development ensures water security and can establish forest-based revenue models in upstream communities. This grant and project will inform others in the hydropower pipeline in South Asia.
Sustainable Solid Waste Management in Mountainous Regions of India, Nepal and Pakistan

**PROGRAM GOAL**
Advise policymakers across energy, water, and forestry sectors about the multiple benefits of smart hydropower planning and infrastructure.

As Himalayan countries face climate variability and search for energy solutions to green growth, hydropower is emerging as an efficient and resilient alternative. Hydropower already supplies nearly 85% of global renewable resources for electricity, and the addition of smart planning and infrastructure in countries like Bhutan, Nepal, and Pakistan can reduce greenhouse gas emissions and provide revenue streams through the sale of electricity.

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Integrated, well designed systems can improve sediment retention upstream, reducing costly maintenance downstream. This type of planning and infrastructure development ensures water security and can establish forest-based revenue models in upstream communities. This grant and project will inform others in the hydropower pipeline in South Asia.
Cleaner Production in South Asia

**PROGRAM GOAL**
Limit pollution, reduce greenhouse gas emissions, improve efficiency, create jobs, and mitigate climate change by promoting resource efficient and cleaner production (RECP) among small and medium enterprises in Bangladesh, India, and Pakistan.

Manufacturing is the primary engine of economic growth in South Asia and the significant pollution costs disproportionately affect the poor who live near factories. Air, soil, and water pollution ultimately erode the GDP and climate resiliency of countries, countering any manufacturing success with consequences for business developers, policy makers, and consumers.

This KGGTF grant will promote resource efficient cleaner production, (RECP) analysis that considers the life cycle, value chain, and environmental footprint of products. This will support reduction of greenhouse gas emissions, improve efficiency, create jobs, and bolster companies for climate change.

On a regional level, government representatives will organize, support and share information and knowledge via forums on RECP. And on a national level, they will work to strength policies and regulations that incentivize and monitor green manufacturing, including frameworks for benchmarking and financing RECP interventions. This grant will also support World Bank RECP lending efforts in South Asia.
Catalyzing Green Investments in Punjab, Pakistan

**PROGRAM GOAL**
To promote green growth policies and practices in Pakistan’s Punjab province that will address growing pollution and waste by catalyzing green investments through technical assistance and dissemination of international best practices, including from Korea.

The Punjab province of Pakistan is facing mounting pollution and waste issues as a result of rapid industrialization and urbanization. This has resulted in rising environmental, social, and economic costs. According to Yale’s 2018 Environmental Performance Index, Pakistan ranks 177 out of 180 countries in terms of environmental health, including aspects such as air quality, water and sanitation deficiencies, and exposure to heavy metals.

To address these issues, this World Bank KGGTF grant will provide resources in support of several key activities as part of a board multi-sectoral program in agreement with the Government of Punjab. Activities include developing a framework for green industrial estates, improving planning for integrated solid waste management, facilitating access to finance for SME investments in resource efficiency and cleaner production, and assessing the scope for Public-Private Partnerships (PPPs) for green infrastructure. The grant will also support a green technology expo to promote knowledge and technology exchanges between Punjab and other provinces of Pakistan with Korea and other countries.

Activities under this grant will make a critical contribution to support the Government of Punjab towards policies, regulations and incentives that will lead to greener investments and a more sustainable future. The program hopes to streamline long-term green growth into project design, to ensure that green investments are more resilient to potential future conditions.
Green Growth in Lao PDR

**PROGRAM GOAL**

Build on previous KGGTF funding to support World Bank Group initiatives that identify and implement green growth solutions.

Economic growth in Lao PDR is averaging nearly eight percent annual increase over the last decade. But that growth is driven in large part by natural resource-based industries such as mining, timber, and hydropower has not translated to poverty reduction. Policy makers worry recent economic growth is environmentally damaging and unsustainable, especially in the face of increased flood and drought risk due to climate change.

This KGGTF grant will support the Government of Lao with technical assistance, analysis, and advisory services to develop a Green Resilient Growth Platform with the National Economic Research Institute and the Ministry of Planning and Investment, among others. The program will work with the Ministry of Natural Resources and Environment to use existing Integrated Spatial Plans as development tools and conduct a sustainable agriculture study in an effort to boost production, reduce greenhouse gas emissions from farming and to build climate change resilience. The government will also analyze in depth the political, legal, institutional, and organizational barriers to implement a Green Resilient Growth Platform.

The analytical work and consensus building that are key to this KGGTF program will support the World Bank’s broader lending efforts in the region to collaborate with the Government of Laos’ on green growth efforts.
Pollution Solutions for Lao PDR’s Green Growth Policy and Investment Agenda

PROGRAM GOAL
To generate and disseminate knowledge that informs the development and implementation of green growth transition policies, and to help with building natural and human capital resulting from better management of pollution.

The annual cost of certain types of pollution in Lao PDR was estimated by the World Bank at 14.6% of GDP in 2017, up from 12.8% in 2015. This figure only includes selected impacts from air pollution; water pollution including arsenic, sanitation and hygiene; and lead exposure. Environmental health risk factors resulted in approximately 11,000 deaths in Lao PDR in 2017, which is equivalent to 22.7% of all deaths. Household air pollution, which disproportionately affects women and children, resulted in 45% of all deaths. Environmental health risk factors also caused nearly 60 million days (or 8.5 days per person) of illness in 2017.

Facing those problems, Lao PDR has been shifting its development trajectory to a green growth path. In February 2019 the Government of Lao (GOL) undertook consecutive, relevant efforts and approved a National Green Growth Strategy 2030 that prioritizes policy and investment action on renewable natural resources, pollution and waste management, environmental fiscal instruments, and nature-based tourism that can drive the circular economy. However, gaps remain in the analytical underpinnings and advisory services provided to the GOL to implement this ambitious reform agenda.

This KGGTF funded activity will support the World Bank’s continuing efforts on policy dialog and technical support to help Lao PDR sustain the good reform momentum. Priority areas are centered on supporting Lao PDR to operationalize its stated green growth policy and investment priorities to drive the circular economy. Examples include technologies, tools, practices, policies and assessments related to air, water and chemical pollution, environmental fiscal instruments, solid waste and recycling technologies and policies, as well as resilient infrastructure technologies.
Sustainable Solid Waste Management in Cambodia, Myanmar and the Philippines

**PROGRAM GOAL**

To provide solutions through policy reform, to Solid Waste Management in the East Asia region. The objective is to draw attention to the effects of inadequate waste management and the impact of solid waste on the environment and health.

Inadequate waste management is a growing problem that poses a threat to public health and potential economic growth in Cambodia, Myanmar and the Philippines. Without intervention, it not only endangers the health and livelihoods of growing populations but poses serious danger to the fisheries sector and coastal areas—ultimately, affecting the growing tourism sector.

KGGTF supports Solid Waste Management sector activities including improving solid waste collection services, community mobilization and awareness creation and incentive based improved waste collection and several activities that address the impact of mismanaged solid waste. Furthermore, this grant responds to the urgency for reform and investment in this sector through large scale information, an education and communication campaign, development of integrated management information system and preparation of solid waste masterplan for Metro Manila.

Through solutions funded by KGGTF resources, and cooperation between the World Bank and the Korean Environment Institute & Technology Institute (KEITI), the focus of this program is knowledge sharing, capacity building, sharing of efficient work practices and seeking benefits through regional advocacy.
Scaling Up Implementation of Vietnam’s Green Growth Priorities

PROGRAM GOAL
To streamline Vietnam's efforts to promote green growth and respond to climate change.

Because of rapid population and production increases, Vietnam is currently locked into coal-powered, energy-intensive economic growth. The associated environmental damage threatens long-term productivity and resilience and limits the country’s growth potential. The Vietnamese government is pursuing a policy agenda that aims to promote a low-carbon, green growth development path while also addressing increasing climate vulnerability.

Building on recently proposed climate change and green growth strategies, this World Bank KGGTF funded green growth implementation program will support analysis, technical expertise, and consensus building around multi-sector greenhouse gas emissions reductions, energy efficiency, energy subsidy reform, green growth, and climate change financing, as well as solid waste, water resource, and air quality management. An annual report will chart recommendations for improvements in the development and execution of policy actions, climate change and green growth expenditures, and a summary of capacity and knowledge generated. Once implemented, these green growth strategies will help reconcile and support policy goals related to poverty reduction, environmental protection, and economic growth.
Investments in Environmental Management and Green Growth

PROGRAM GOAL
To support Peruvian policies related to environmental sustainability and aquaculture management.

Peru is plagued by poor air quality in urban areas, indoor air pollution, water and sanitation problems, deforestation, and overfishing. It is working to strengthen its natural resources management policies to boost environmental stability, facilitate poverty alleviation, and spur economic growth.

This World Bank KGGTF funded green growth implementation program will support two Peruvian policies related to environmental sustainability and aquaculture management. By improving the country’s analytical capacity and environmental regulatory framework, in addition to investigating how best to modernize fisheries, this program aims to restore public trust in the government’s ability to manage natural resources into the long-term. Armed with better information, the national Ministries of Environment and Production will be better able to support local governments in their efforts to manage environmental health.
Sustainable Development in Bolivia and Mexico

**PROGRAM GOAL**
Support Bolivia and Mexico as they collaborate on methods to reduce environmental pollution and resource scarcity. Establish practices for effective environmental management and climate change mitigation.

Bolivia and Mexico represent Latin American countries at different stages of climate change adaptation and green growth progress. Bolivia is eager to find ways to sustain impressive economic growth and poverty reduction without the depletion of natural resources. Mexico has already adopted a range of climate change policies.

This grant will facilitate analysis of short-lived climate pollutants and air pollution in Mexico, which will establish a baseline for potential investments. It will facilitate capacity building in Bolivia to address energy efficiency and greenhouse gas emissions reductions, develop environmental quality standards and establish enhanced air and water monitoring networks. The program will also fund development of additional financial incentives for the use of renewable energy.

The two governments will collaborate and share best-practices to create and implement policy reforms that will contribute to inclusive green growth. Key areas of focus are: reducing air pollution, water and sanitation services, and greenhouse gas emissions. Bolivia has also reached out to the World Bank for additional capacity building and analysis related to environmental management and climate change. Mexico has requested similar funding from the World Bank to further its climate change mitigation, adaptation, and resiliency efforts. This KGGTF grant will fund critical components of larger efforts in both countries and the region.
In Brazil increasingly severe droughts are becoming the new normal and causing concerns about the municipal, industrial and irrigation water supplies. The Decision Making Under Deep Uncertainty framework is being applied to find solutions.
REGION: Latin America and the Caribbean
COUNTRY: Colombia
SCALE OF IMPACT: National
TECHNICAL AREAS: GG Resource Mobilization, National GG Implementation
KGGTF PROGRAM YEAR: 4
STATUS: On-going

PROGRAM GOAL: Support the Colombian Government to implement its 2014 Sustainable Development Plan for lasting peace and environmental protection.

Building on steps it took when it joined the OECD in 2012 and then in 2014, when it laid out a sustainable development plan that supports both lasting peace and environment protection, the Colombian government is now ready to take its green growth strategy to the next level. This KGGTF grant will help to fund the implementation of Colombia’s 2014 plan by providing on-the-ground technical assistance and capacity building opportunities related to economic and regulatory analysis, efficient use of resources, and data collection. In particular, this grant would help Colombia prioritize policy work, build consensus around specific projects, and help create the necessary regulatory framework for implementation over the next 15 years.

In addition to supporting Colombia progress its green growth strategy, the results of this program will inform related World Bank green growth lending projects in Vietnam, Morocco, and Madagascar.

Green Growth in Colombia

PHOTO: DOMINIC CHAVEZ / WORLD BANK

The Colombian Government's Green Growth plan includes policies that provide job opportunities to support successful reintegration of the internal-guerrilla terrorists known as FARC, into the larger economy and civil society.
URBAN

URBAN EAST ASIA AND PACIFIC

SOUTH ASIA

EUROPE AND CENTRAL ASIA

MIDDLE EAST AND NORTH AFRICA

AFRICA

LATIN AMERICA AND THE CARIBBEAN

GLOBAL

MIDDLE EAST AND NORTH AFRICA

AFRICA

SOUTH ASIA

EUROPE AND CENTRAL ASIA

LATIN AMERICA AND THE CARIBBEAN

GLOBAL

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PROGRAMS

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The recent influx of refugees into Jordan has caused extreme pressure on local and national services. The government is looking to address a range of public services, including housing, education, water, sanitation, transportation and solid waste management that are under acute strain due to the dramatic population rise, and often the source of challenging social issues and tensions.

The Jordanian government is looking to establish local and national policies to support the transition to a green growth economy. In particular, the development of: green growth analytics, policies, and capacity to address the rapid population increase, and solutions to support sustainable urban expansion and regional job creation. Jordanian policy-makers are seeking to explore the most effective ways to expand infrastructure while taking into account the financial implications of energy use, carbon footprints, and the most effective way to provide for immediate and long-term job opportunities.

**GREEN GROWTH STRATEGIES**

The KGGTF is supporting Jordan as it transitions to an economy based on green growth policies, develops infrastructure and affordable housing for its people, and adopts solutions that are long-term resilient and capable of meeting the demands of its increased population. Grant activities being funded bring together two vital components of a successful transition: Vision and Methodology.

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**KGGTF SUCCESS STORY**

**Greening Growth for the Displaced in Jordan**

**CONTEXT**

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In Jordan the influx of refugees from neighbouring Syria is causing acute strain on local resources. All aspects of urban planning are being assessed to decide how to best position the country for future success.
KGGTF ACTION & SOLUTIONS

Vision  South Korea’s remarkable recovery from war and poverty provides a case study with specific solutions for economic advancement, creation of employment opportunities, urban reconstruction and city planning that are highly relevant for any country looking to transform or rebuild its economy. The KGGTF facilitated a Knowledge Exchange study visit to South Korea, focused on urban growth planning. The study visit was designed for national and municipal policy decision-makers and officials from Jordan.

Delegates from Jordan acknowledged the value of experiencing Korea’s green growth approach for themselves, gaining knowledge and learning practical lessons in critical areas including institutional frameworks and governance structures, urban development and transportation, ecological restoration and stakeholder engagement.

Methodology  With KGGTF funding the Kingdom of Jordan is exploring urban growth scenarios by developing a dynamic planning tool that facilitates the understanding of different possible outcomes related to specific urban policies. These policies can range from transport or infrastructure investment plans, to land use changes and inclusive housing policies. This methodology uses scenario modeling to assess the physical, economic, environmental and demographic impacts of implementing public policies and projects (known as policy levers) to predict outcomes such as the infrastructure costs, energy consumption, and greenhouse gas emissions associated with different scenarios. For example, compared to compact, high-density development, urban sprawl, low-density development would consume more land, incur higher infrastructure costs, and emit more greenhouse gases. Urban Growth Scenario Modeling is able to measure and predict specific outcomes and visually display the results in different urban development scenarios, providing concrete support to consensus building and policy making.

TRUST FUND IMPACT

Insights and key lessons learned from the Korean study tour were presented at a National Workshop where ministers and senior officials from central and municipal governments gathered to explore urban development vision and strategies. A report on different urban growth scenarios and their implications for infrastructure costs, carbon footprint, and land use has been produced, and a toolkit on how to apply this analytical model and engage policy makers in other parts of the world is being produced to further scale up the impact of KGGTF funded initiatives.

“The Koreans have been very smart in leadership and the management of time and human resources.”

AMER NAYEL MOHAMMAD AL-DUGMI, MAYOR, MAFRAQ MUNICIPALITY
“It was a very good opportunity to exchange ideas regarding urban growth. There was rich information that may help members of the delegation to develop proposals regarding urban growth across multiple sectors.”

MOHAMMAD ODEH EMARA AL ADAILEH, HEAD OF LOCAL DEVELOPMENT AND PRODUCTIVITY ENHANCEMENT DEPARTMENT, MINISTRY OF PLANNING AND INTERNATIONAL COOPERATION (MOPIC)

URBAN GROWTH SCENARIO MODELING

Policy Levers
Policy Levers assess the physical, economic, environmental and demographic impacts of implementing public policies and projects (known as policy levers) to predict outcomes such as the infrastructure costs, energy consumption, and greenhouse gas emissions associated with different scenarios.

Each public policy decision or project causes a chain-reaction of consequences. The policy lever allows for a clearer understanding of each potential policy.

Scenario Modeling
Systematically assessing the physical, economic, environmental and demographic impacts of a specific policy.

Outcomes
The results of specific policy and investment decisions.
Low-carbon Green City Planning

PROGRAM GOAL
To integrate low-carbon development into urban planning frameworks, opening carbon finance opportunities for local governments.

Developing and applying low-carbon green planning systems will help cities move towards sustainable economic growth, but reducing greenhouse gas (GHG) emissions must take place in the context of comprehensive urban development, and financial incentives play a key role. A global joint effort of the World Bank, UEA, Gwangju City (Korea), UNEP, and UNFCCC low-carbon green city planning aims to integrate low-carbon development into urban planning frameworks, opening carbon finance opportunities for local governments. It increases financial opportunities using a new approach that builds on best practices in GHG inventories and climate mitigation strategies, and on city experiences of carbon finance, including Amman, Jordan and Rio de Janeiro, Brazil.
Capacity Building for Green Urban Growth

**PROGRAM GOAL**

To build and strengthen green growth strategic, practical and technical know-how to improve urban land use planning. To contribute to resilient, environmentally and socially inclusive urban growth.

With more than half of the world living in cities, and with urban populations expected to double in developing countries in a generation, rapid urbanization poses one of the greatest challenges of the century. The program sees this as an opportunity to implement new approaches, new markets, new technologies, and new values for green economic growth. The program aims to build and strengthen green growth strategic, practical and technical knowhow to improve urban land use planning, and contribute to resilient, participatory environmentally and socially inclusive urban growth. The program will contribute to global knowledge by developing and piloting practitioner e-learning training modules on cutting-edge urban land use planning and management techniques. The KGGTF will facilitate peer-to-peer learning through knowledge exchange workshops and virtual practitioner networks.
Green Smart City Development with Citizen Participation in India and Tunisia

PROGRAM GOAL
Develop a national master plan to enable Tunisian and Mumbai authorities to access digital land information and to address urban challenges.

Cities face a number of challenges to green urban development, including poor land cadaster systems (a comprehensive land ownership register), poor public services and living environments, and high unemployment and poverty-related violence. These challenges call for innovative, tested urban management solutions to promote shared prosperity. Building on the World Bank’s e-Government program on ICT for urban management, this grant will develop a national master plan for Tunisian leaders to access digital land information for its cadaster system. It will support innovative ICT pilot programs to help authorities address urban challenges. This project will provide examples and best practices for cities on how to overcome economic growth obstacles and will incorporate ideas from Korea, the global leader in e-Government.

In India, the government is working to address urban challenges with ideas from Korea, a global leader in e-Government.
City Creditworthiness Academy and City Climate Planner Certification Program

GLOBAL

SCALE OF IMPACT
Global

TECHNICAL AREAS
City Climate Planner Certification, City Climate Financing

KGGTF PROGRAM YEAR
1

STATUS
Completed

PROGRAM GOAL

To share knowledge and expertise on how governments can manage waste and promote economic growth and prosperity.

Goals to improve efficiency, resilience, and competitiveness are driving the building of greener cities. Sustainability need not come at the expense of growth, but the building of sustainable cities requires knowledge of challenges and GHG emissions expertise. KGGTF’s urban portfolio continues efforts started in Y1 by building human resource capacity to help cities plan sound climate programs based on green growth implementation standards. The three-year USD $1.37 million program, which will reach 150 cities by mid-2015, has completed a strategy paper and roadmap for developing a City Climate Planner Certification programs. The program team has finalized an emission inventory training program, and the partners will meet to commit financial resources and identify roles to take the program forward. The program will certify its first group of professionals in the summer of 2015. The program is also helping build cities’ capacity to access private capital to finance low-carbon, climate resilient infrastructure. The Low-carbon Livable Cities initiative’s City Creditworthiness Academy held five-day workshops in Colombia, Tanzania, and Korea in 2014 for municipal finance officers from several dozen regional cities. The program will hold its final regional event in Senegal in 2015. Program staff will summarize outcomes from participating cities in a 2015 report.
An Integrated Approach to Urban Sustainability Planning across World Bank Lending Programs

PROGRAM GOAL
To help urban centers learn from the experiences of other cities’ green growth strategies.

Rapid urbanization makes it difficult for cities to develop in a safe, sustainable way. It should come as no surprise that knowledge from city leaders around the globe is one of the best ways to ensure that urban centers can overcome the fiscal and capacity constraints that hinder green growth.

This KGGTF funded program supports the Global Programs unit of the World Bank Group—a division that connects Bank operational teams with relevant knowledge from both within and without the Bank. The Global Programs unit develops new knowledge when needed and brings cutting edge approaches to improve operational activities and enhance the impact of urban projects. The end goal is to support improved efficiency, greater resilience, and increased competitiveness in busy urban centers worldwide.

The Han River is arguably the most defining landmark in Seoul. Urban planners have created pedestrian walkways, bicycle paths and public parks along the river for the enjoyment of residents and visitors.
Enhancing Green Urban Development in Uganda, Tanzania, and South Africa

**PROGRAM GOAL**
To assist cities planning to use green growth principles and innovations.

Rapid urbanization is a welcomed continent-wide trend in Africa. This program aims to assist cities anticipating using green growth principles and innovations. New rapidly growing cities can avoid the severe consequences stemming from inefficiencies, pollution, and other related factors, and could benefit from early interventions to enhance economic and spatial growth. Assisting national and local governments of cities in Ghana, Kenya, Mozambique, Senegal and Tanzania, the program is helping to identify and diagnose key bottlenecks and constraints to sustainable, green development. It is also promoting and strengthening integration of sustainable management, environmental and green development initiatives and activities in future development strategies.
Enhancing Green Economic Development in Rwanda’s Secondary Cities

**PROGRAM GOAL**
To enable Rwanda to develop the Green Growth economic potential of secondary cities.

The Rwandan government’s Economic Development and Poverty Reduction Strategy envisions urbanization as a driver of growth. Kigali—Rwanda’s national business, service, industrial and administrative hub—already plays a pivotal role in developing the national economy. However, environmental degradation has become a serious concern. Given that, the Government of Rwanda is pursuing a more-balanced urban-development policy for maintaining Kigali’s current economic status while developing economic growth in some of these secondary urban areas. The activities under this KGGTF grant have been critical in shaping lending for the Rwanda Urban Development Project (US$ 95m) and will form the basis for implementation. These activities will include:

i) creating an inclusive upgrading plan and apply lessons that be used in other secondary cities;

ii) developing options for sustainable local economic development programs in Rwanda’s six secondary cities;

iii) utilizing ICT tools in planning;

iv) supporting the integration of resilience and sustainability principles in the selection and implementation of infrastructure projects to be supported under the lending operation; and

v) supporting the design of a performance based grant for secondary cities.

The lending project was approved by the World Bank board in March 2016 and became effective in July 2016. The grant support from the KGGTF was instrumental in financing technical inputs in the process.
Solid Waste Management Policies and Technologies

**PROGRAM GOAL**

To share knowledge and expertise on how governments can manage waste and promote economic growth and prosperity.

Dealing with solid waste is an enormous challenge for many countries facing rapid urbanization and economic growth. In many countries, solid waste management contributes significantly to social stratification: “waste pickers” descend on waste sites in poor urban areas with especially poor solid waste management services. Governments can harness “waste” to generate profits, lower GHG emissions, and contribute to shared prosperity, while reducing poverty and improving quality of life. Green waste management can also save billions of dollars for citizens, cities, and nations.

Countries such as Korea have used technology to harness solid waste management to tackle similar challenges since the 1960s. Peer-to-peer learning is one way the KGGTF’s program is sharing knowledge about how governments can manage waste and promote economic growth and prosperity. Korea will “pay forward” lessons from its experience for the benefit of the countries of China, Benin, and the Central African Republic. The program team will first assess the needs of participating cities before producing case studies outlining lessons learned and best practices, translated into multiple languages and delivered over an online platform. Topics covered by the case studies will include describing the solid waste value chain, from collection and transport, through to disposal, diversion and energy recovery. The program team is also organizing knowledge events, webinars, workshops, and learning visits for authorities facing acute solid waste management challenges. Case studies combined with technical knowledge will help city authorities put plans into action.

As the cross-sector collaboration strengthens knowledge related to common challenges, the program will support on-going World Bank initiatives, including municipal and global solid waste management programs, a regional and city improvement program, the Benin emergency urban environment program, and the Benin cities support program.
Improving Solid Waste Service Delivery in African Cities

PROGRAM GOAL
To improve solid waste management in four Sub-Saharan African cities.

There are several obstacles to managing municipal solid waste in Sub-Saharan Africa, including a lack of infrastructure, regulatory and legal challenges, rapid urbanization, and a scarcity of financial resources. Uncollected and untreated waste in many of the region’s cities impacts human health, especially for the poor who live nearby. Improper solid waste management represents a serious impediment to inclusiveness and green growth. By improving municipal solid waste collection, cities can create opportunity and cultivate resilience: Solid waste management can help keep drainage channels open, thus reducing their vulnerability to the anticipated frequent and intense rainfall and sea level rise that accompanies climate change. This green growth implementation program will foster green growth by identifying the solid waste investment needs in four Sub-Saharan African cities and assuring that policy makers have direct access to implementable policy recommendations, as well as support to improve solid waste management in their city.
Reducing Flood Risk in Mali’s Urban Areas

PROGRAM GOAL
To reduce flood risk in Mali’s urban areas, particularly Bamako.

Urban flood risk is increasing in part because of weak urban land use planning and uncontrolled occupation of flood-prone lowlands, riverbeds, and floodplains. Flood risk in Bamako, Mali, is an archetypal example of the increasing vulnerability of cities to flooding. This program will create real-time, high-resolution rain maps based on cellular network signal attenuation. The data will model rainfall runoff and flood risk and provide authorities with the tools to issue flood response plans and shift habitation patterns away from flood-prone areas.

In Bamako
the government is working with WBG KGGTF to build early flood warning alert systems. Residents receive a text message warning that will provide information and instructions for evacuation.
Technical Assistance for Sanitary Landfill Operations in Ethiopia

**PROGRAM GOAL**
To complete a sanitary landfill in Bishoftu, Ethiopia, that will help the city remain resilient, competitive, and clean.

Currently solid waste in Bishoftu, Ethiopia, is dumped in an open field located near the city center, raising concerns about groundwater pollution and the spread of communicable diseases. This green growth implementation program will render a new sanitary landfill operational through the development of a management plan and staff training, as well as the financing of equipment. In turn, Bishoftu’s new landfill would ultimately contribute to the reduction of city’s carbon emission, cleaner groundwater, and a more environmentally sustainable city. Bishoftu could serve as a model for other cities in the region hoping to improve solid waste management.

Improving Solid Waste Management in African Cities

**PROGRAM GOAL**
Support decision-makers in African cities identify and implement sector policies, institutional reforms, and sustainable financing mechanisms to improve solid waste management across the entire waste management system.

As urban populations grow in cities across Sub-Saharan Africa (SSA), solid waste management (SWM) is becoming increasingly challenging. Low-income countries in SSA face problems at nearly every level of the waste management value chain—from lack of proper infrastructure and inadequate collection system to financial and regulatory impediments.
Without adequate collection or disposal options, garbage is typically burned or openly dumped. Resulting in air pollution and contributing to global climate change, clogging waterways, attracting vermin, contributing to the spread of disease, damaging the environment, and negatively impacting quality of life, particularly for poor and vulnerable populations.

Building on previous activities, which resulted in pipeline lending projects in Senegal and Mauritania, the program will engage an additional three countries in the region to collect municipal-level data on a number of key parameters, offer recommendations on different aspects of waste management, and develop case studies to share information between cities with similar challenges.

The output will be reports offering concrete recommendations to policy makers that will help the solid waste sector become an integral part of an urban green growth strategy. These guidelines will inform World Bank investments and policy dialogue to improve SWM in these cities and countries in the way that promotes green growth.

This program will benefit from completed and ongoing activities supported by KGGTF in years 2 and 3. It will expand on previous projects, as well as draw from policy notes based on Korea’s experience designing and implementing transformational waste management policies and technologies in the SWM sector. The program will benefit from previously funded capacity building for African officials who joined study tours and targeted workshops in Korea, taking this work to the next stage where investment opportunities can be mainstreamed to boost inclusive green growth in these cities.
PROGRAM GOAL
To tackle spatial and institutional fragmentation in Bamako by making more productive use of land, improving urban service and supporting institutional development and coordination.

Bamako is the world’s 6th fastest growing city, but it is not fulfilling its role as an engine of sustainable urban growth and service delivery. The city’s population rise averaged 5.4% between 1998 and 2009 and is expected to reach 4.2 million by 2025. Urban sprawl has been associated with unequal access to basic services and limited mobility, mostly due to the absence of adequate investments in infrastructure.

There is also a lack of institutionalized support that hinders development, significantly limits access to high-quality disaggregated data, and hampers technical capabilities and administrative coordination. In consequence there are barriers to creating well-informed, inclusive urban planning, and implementing knowledge of green approaches to infrastructure.

The activities proposed under this grant will inform the metropolitan-wide urban planning process and capability building. They will support the Bamako Urban Master Plan through completion of feasibility studies for green infrastructure, technical assistance, creation of a comprehensive data platform and rapid area-based diagnostics. In the longer term, this would help to free up crucial private and public resources for other infrastructure investments needed in the region. Thanks to the utilization of transport-oriented development strategies, green spaces, and urban regeneration, the project will also lay the foundations for a greener and more competitive environment for future growth.
Enhancing Green Growth in Cairo

**PROGRAM GOAL**

Equip Cairo with the skills, knowledge and framework for developing a Green Growth strategy that will enable it to achieve it’s 2030 Sustainable Development goals.

Greater Cairo, a city of 20 million inhabitants, has some of the worst air pollution and traffic congestion in the world. Current environmental conditions take a substantial toll on human wellbeing and hinder the economic performance of the city. This program aims to evaluate and establish reforms to enable effective metropolitan governance, develop a green growth strategy, introduce technical support and build capacity.
Developing Green Growth Strategies for Emerging Metropolitan Municipalities in Turkey

**PROGRAM GOAL**
To create a green growth information platform which includes green growth indicators and collects baseline data to analyze key urban planning variables including land, housing, transport, energy efficiency, and infrastructure.

As Turkey embarks on a national effort to promote sustainable cities, KGGTF’s two-year program is providing technical assistance to create a green growth information platform. The platform will include green growth indicators and collect baseline data to analyze key urban planning variables, including land, housing, transport, energy efficiency, and infrastructure. The program team will also prepare sustainable city action plans using a framework informed by the platform. The program will prepare a report for Turkey modeled on the Korean Industrial Complex Corporation. The report will present options for the Government to transform industrial zones into eco-friendly areas.
Moving Towards the Greener Urban Development of Kyrgyz Cities

PROGRAM GOAL

Halt urban sprawl in Kyrgyz and build a roadmap for green growth.

Population shifts in the Kyrgyz Republic have brought 42% of residents to urban areas, but cities have not grown to accommodate them. Many find their way into semi-informal settlements on the periphery of cities. These sprawling settlements come at a high environmental, energy, and economic cost, now requiring municipal services, such as roads, without being high-density enough for investments in public transportation. Poor populations that live on the periphery are often disconnected from health care and education opportunities in the city center. This green growth implementation program will help create awareness around this damaging urban growth pattern and assist the government in identifying policies and a roadmap for urban densification. In the end, greening urban areas will be a source of economic growth and climate change resilience.

Cities in Central Asia are searching for solutions to accommodate their growing populations. The policies and strategies chosen will have repercussions for decades to come. KGGTF is working with government leaders on how to integrate green growth principles into their city plans.
Leveraging Green Growth for Balanced Spatial Development in Uzbekistan

PROGRAM GOAL
Support the mainstreaming of inclusive green growth principles in the upcoming urban and spatial development program and demonstration projects in Uzbekistan.

Cities and urbanization have played a key role in Uzbekistan’s economic development. To achieve sustainable growth and create needed jobs to accompany it, an integrated approach needs to be put in place to promote efficiency and support the delivery of municipal services. The need for efficient and resilient local services and infrastructure, and the creation of livable and inclusive urban environments are factors urgently needed to cope with current challenges emerging in Uzbekistan.

This KGGTF funded program will initiate action at both the institutional and operational levels, with expected mutually reinforcing results. At the institutional level, activity will support policy dialogue on issues of inclusive green urban and spatial development, eventually contributing to the development of a national program for spatial and urban development in Uzbekistan that builds on the principles of inclusive green growth. At the operational level, it will apply a holistic approach to the identification, prioritization, design and implementation of urban services and infrastructure investments that improve livability of medium-size cities demonstrating the application of green growth principles.
**REGION**
South Asia

**COUNTRY**
India

**SCALE OF IMPACT**
National

**TECHNICAL AREAS**
EIP, Urban Development, Freight, Land Management

**KGGTF PROGRAM YEAR**
1

**STATUS**
Completed

**PROGRAM GOAL**
To analyze economic and physical development opportunities associated with connectivity improvements through a 1,839-km corridor.

This multi-year program for Indian officials, including the Ministry of Urban Development, analyzed economic and physical development opportunities associated with connectivity improvements through a 1,839-km corridor. Already embarking on low-carbon transition, the program also identified options to maximizing those opportunities, including good policies and programs. The team also summarized the socio-economic and demographic profile of the six states lining the corridor, and identified the most promising three sub-regions in the state of Uttar Pradesh as potential industrial and logistic hubs for continued in-depth studies.
Mainstreaming Green Growth into Karachi’s Business Plan in Pakistan

PROGRAM GOAL
To support analytical work and knowledge exchange on master infrastructure investment planning to move the Karachi Strategic Development Plan (KSDP) along from simply a vision to a true operational business plan.

With a metropolitan population of 17 million, which is expected to rise to 28 million by 2030, Karachi contributes 20% of the GDP and nearly 45% of the national economic value-added, despite many challenges to competitiveness and livability. The KSDP 2020 lays a foundation for future policy and investment planning. The Plan is guided by principles safeguarding quality of life, promoting inclusivity, and fostering sustainability, and includes green initiatives in transport, drainage, solid waste management, and other sectors. The program aims to support analytical work and knowledge exchange on master infrastructure investment planning to move the KSDP along from simply a vision to a true operational business plan.

Karachi looked at global best practices to inform its Strategic Development Plan 2020. Working with WBG KGGTF the government learned valuable lessons from Korea on how to operationalize their vision.
India E-Waste Advisory Project

**PROGRAM GOAL**

Create the first of its kind e-waste take-back program in India.

As its economy grows, India faces burgeoning volumes of waste from electronics (e-waste). When harnessed, “e-waste” can be a resource, creating jobs and raising incomes for informal and formal sector workers, while preventing toxic materials from harming citizens and the environment. Operationalizing the concept of green growth, KGGTF’s three year e-waste advisory program is creating the first of its kind e-waste take-back program in India. Through successful pilot operations in three cities, the program team has established a sustainable business model that India and other countries can replicate in cities facing similar challenges. In an effort to scale up this successful model by collaborating with leading producers of electronic items and recyclers of e-waste, the team is developing a sustainable industry led solution to the e-waste challenges in India by establishing a Producer Responsibility Organization which will serve as a cost-effective, long term and countrywide solution to the e-waste challenges in India.

**E-Waste** is a growing concern as the volume increases and the detrimental health implications become clear. This pilot project is working with electronic producers to develop long-term, cost-effective solutions.
Technical Assistance for Design and Preparation of Tamil Nadu Sustainable Urban Development in India

PROGRAM GOAL
To support the Indian State Government of Tamil Nadu to design and prepare the Tamil Nadu Sustainable Urban Development Project (TNSUDP) to increase competitiveness of the state’s cities.

The KGGTF’s technical assistance program supports the Indian State Government of Tamil Nadu to design and prepare the TNSUDP to increase competitiveness of the state’s cities. Linked to a World Bank USD $400 million loan to co-finance the USD $600 million TNSUDP, KGGTF technical assistance will cover a number of green urban interventions to improve urban management and infrastructure, and promote municipal financial sustainability for Urban Local Bodies participating in the TNSUDP. Along with improvements to sewerage and solid waste management, the program will foster greater autonomy and accountability in city management, while integrating urban planning and improving financing instruments. These improvements will in turn help cities deliver better urban services to citizens and businesses.
Urban Development and Solid Waste Management

**PROGRAM GOAL**
To create a spatially differentiated development strategy that encompasses green growth principles.

The government of Sri Lanka aims to promote economic growth both in the capital region and across multiple provinces. The process of urbanization in the capital, along with a shifting of government leadership to a more regionally focused approach requires new policies and governance structures.

This KGGTF grant will support the government as they work on spatial expansion issues, and will include a particular focus on solid waste management.

Additional components will include supporting local leaders, as they work for the first time, to include environmental and social issues into the policy making process. This grant activity will directly influence the Government’s policy making plans for the capital region, and will further identify and prepare future Bank investments.

Urban Public Spaces as a Transformative Instrument for Inclusive Green Growth in South Asian Cities

**PROGRAM GOAL**
Effectively leverage well-planned urban public spaces for economic growth and environmental stewardship.

Public spaces, including parks, waterfronts, squares, and buildings, if well-planned, can play an important role in addressing urban challenges by encouraging economic growth, social inclusion, and urban greening. Despite their importance, public spaces are often poorly integrated or neglected in the process of planning and developing cities in the region. Public space is particularly critical in less-fortunate neighborhoods, as individuals lack the resources for private outdoor space.
Regional Economic and Infrastructure Investment Strategy for Uttar Pradesh

PROGRAM GOAL
Support government partners to develop an implementation strategy to bolster accessibility and productivity in selected economic clusters, and reach many of the state’s 200 million citizens.

This investment continues support for building the Amritsar-Kolkata freight corridor and strategically integrates economic development, urban planning, and transportation. The program will improve efficiency, promote resilience to extreme weather, reduce urban congestion, and increase regional competitiveness. It will further examine economic structures and patterns of industrial clustering, infrastructure, and logistics to support the development of an implementation strategy to bolster accessibility and productivity in selected economic clusters.

Creating economic clusters will expand access to jobs for the state’s 200 million citizens. The program also supports related World Bank initiatives under the umbrella of the SAR Urbanization Flagship.

Uttar Pradesh is working to develop economic cluster zones along the Amritsar-Kolkata freight corridor. The goal is to strategically integrate economic development, urban planning and increase regional competitiveness to provide job opportunities for the state’s 200 million citizens.
Sustainable and Green Regional Development Plan for Urban Growth Centers in India

**PROGRAM GOAL**

To better plan for the growth of peri-urban areas around India’s largest cities.

An additional 250 million people are expected to move into India’s already-crowded cities by 2030. This rapid urbanization, coupled with straightjacketed urban land policies, has forced the evolution of peri-urban areas as new townships along existing transport and communication corridors. This sprawl threatens urban containment, and therefore environmental sustainability. This green growth implementation program will improve planning and economic decision-making. The key areas of focus are Bhopal and Indore in Madhya Pradesh, and the sprawl that is happening between these two urban centers, as well as the Thane-Pune area outside of Mumbai. The program will prepare a comprehensive, green, and smart regional development strategy that will promote sustainable economic development, job creation, an integrated approaches for effective urban-rural linkages, and protect valuable agricultural land.

**Urban sprawl along transport corridors threatens environmental sustainability as the population increases. Smart regional development strategies will promote sustainable economic development and protect valuable agricultural land.**
Greening Karachi

PROGRAM GOAL
Transform Karachi into a livable, competitive, world-class city.

Pakistan’s capitol is an important economic engine and accounts for 20% of the country’s GDP and 40% of large-scale manufacturing jobs. Karachi citizens currently experience overcrowding, inadequate public infrastructure and over 60% of the population resides in inadequate hosing.

This program is a critical component of the World Bank Group’s commitment to Pakistan to support the transformation of Karachi into a livable, competitive, world-class city. Experts will analyze Karachi’s business challenges, social inequalities, environmental health, and infrastructure gaps and find policy solutions to support and transform the city.

This second year of funding will focus on solid waste management studies, urban revitalization, and a framework for social inclusion. The Korea Research Institute of Human Settlements will advise on upgrading historic districts. Additional revisions to urban planning will include renewed public spaces, better pedestrian connectivity, and urban revitalization. These extensive changes will create a more inclusive, competitive economy that strengthens the economic and social fabric of Karachi.
ICT Enabled Integration in India

**PROGRAM GOAL**

Inform the development of tools and best practices for smart city solutions that will lead to efficient, resilient, and competitive urban environments.

Real time data can transform transportation and energy use decisions for cities and citizens. This phase two grant builds on the implementation and analysis of three pilot projects that identify ICT solutions for sustainability across energy, water, urban, and transportation sectors. Phase two curates a service platform that is pre-loaded with relevant ICT applications for cities. The prototype will be piloted, and when proven successful, offered across the region. Grant participants including local governments and stakeholders will collaborate with World Bank projects and lending efforts, and with Korean experts to create the Korea-South Asia Region Smart Cities Innovation Network. Participants from at least 100 cities or organizations will be provided with the tools and best practices leading toward more efficient, resilient, and competitive urban environments.

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**A cloud-based ICT platform** is being developed that will offer digital tools to support cities to build and manage efficient, resilient, and competitive urban environments.
Supporting Green Growth Urban Development and Planning Processes in Nepal

**PROGRAM GOAL**
Create the processes to review and imbed green growth principles into Nepal's upcoming infrastructure investments.

Nepal has a new constitution and with it a shift from a unitary to a federal governance system that changes the constitutional provisions of executive authorities and the revenue sources of provincial and local governments. This coupled with intense urbanization over the last few decades has led to a variety of infrastructure and basic service delivery deficits. The government is looking to establish strong local governance systems and establish the proper policies and frameworks for implementing green growth principles as they go forward with infrastructure investments across multiple municipalities.

Building on previous World Bank projects, this KGGTF program will support the provision and improvement of basic service delivery across 16 secondary cities, while also supporting the new federal structure and inter-governmental fiscal transfer mechanisms. In particular, the program will help national and local policy makers address key deficiencies such as: building capacity of municipalities in basic urban management, strategic and sustainable urban planning, and prioritizing green growth investments. Additionally the program will support the establishment of guidelines, relevant performance indicators, the collection of baseline data and a review of relevant legal and institutional framework to determine priorities for investments. The activity will engage participating cities and key public and private stakeholders in the process. By preparing city-specific policies and plans this program will align with Nepal’s National Urban Development Strategy and promote urban resilience and effective urban management by designing smart urban land use plans.
Sustainable Urban Growth Analytics and Planning Systems: Technical Advisory Services to Three Large Indonesian Cities

**PROGRAM GOAL**

To identify trends in the spatial expansion of cities to assist local governments to improve urban spatial planning.

Indonesia is one of the most urbanized countries in Asia, with an urban population share of 54% in 2010. The Bank through support from KGGTF is supporting the Government of Indonesia on promoting urban green growth by improving spatial planning and integrated databases in selected cities. The sustainable urban growth analytics and planning systems program team is identifying trends in cities’ spatial expansion to strengthen capacity in sustainable urban spatial growth analytics; and link sustainable growth analytics to improved spatial and investment planning. The program analyzes the determinants of spatial growth patterns and implications for green urban growth, and outlines sustainable infrastructure investments in three cities. The program has provided selected local government officials with hands-on spatial planning training and will also host a national workshop with governments to discuss policy implications stemming from the study results, where the workshop will invite urban stakeholders in the central government level, selected local governments, and partners from KGGP and SMG.
Inclusive Green Growth for EAP Cities

**PROGRAM GOAL**
To help city leaders choose energy efficient solutions for infrastructure and develop a sustainable urban energy and emissions plan.

The inclusive green growth for East Asia-Pacific cities program is helping address rapid urbanization in the city of Surabaya by helping the Government learn best practices in green growth planning. Incorporating methodologies developed from Korea’s inclusive green growth experience. The program will help Surabaya leaders choose energy-efficient solutions for infrastructure and develop a sustainable urban energy and emissions plan. Participation will help Surabaya leadership promote Surabaya’s low-carbon city development agenda, leading to a virtuous cycle: improved capacity for policymaking and urban energy and green investment management should in turn attract private sector investments to improve the local economy. The approach will be useful to cities in other countries facing similar challenges.

City leaders in Surabaya are building energy-efficient infrastructure and establishing policies to support a long-term urban energy and emissions plan.
Promoting Green Growth in Industrial Zones in Vietnam

**PROGRAM GOAL**

To create a scalable model for Vietnam’s industrial zones.

Vietnam’s consumption of electricity has increased by 400% over the last decade, in part because of low efficiency and obsolete industrial technologies. Government studies show that the cement, textile, steel, and food processing sectors could use at least 20% less energy if managed efficiently. Using examples from Korea and International Finance Corporation (IFC) experience in Bangladesh and China, the KGGTF’s two-year program is creating a scalable model for Vietnam’s industrial zones. The program team will demonstrate clean, efficient energy usage in multiple neighboring factories to show local authorities, the private sector, zone management companies, and Vietnam’s Ministry of Planning and Investment how to create low-carbon industrial parks. Through workshops with these stakeholders, the program will share case studies and raise awareness about innovative technologies for greening industrial parks. Interventions planned for pilot cities will reduce CO2 emissions by 100,000 metric tons while decreasing freshwater use by 500,000 m3 annually.

*Creating low-carbon industrial zones will ensure the government has the tools to implement appropriate policies to support industries as they expand and create new jobs.*
Citywide Slum Upgrading in Metropolitan Manila

PROGRAM GOAL
To contribute to citywide development under the National Informal Settlement Upgrading Strategy in Manila.

Metro Manila is home to 12 million people, accounting for one-third of the population of the Philippines, and half of the country’s economic output. Regular flooding affects 2.4 million in Manila, creating an urgent need for safe shelters for the city’s 100,000 informal settler families. To promote inclusive growth and bolster flood resilience, KGGTF’s program supports citywide development under the National Informal Settlement Upgrading Strategy. Piloted in three of seven cities in Metro Manila, and reaching 400,000 citizens living in vulnerable slums, a citywide shelter plan will guide new construction and create jobs. Participatory, community-led planning, mapping, and surveying approaches also will empower residents. Once tested, authorities can replicate the program in other cities.

Affordable and Resilient Housing and Urban Land Use Planning in Vanuatu

PROGRAM GOAL
Reduce the risk of natural disaster on urban dwellers.

Vanuatu, a small island nation of 250,000 in the South Pacific, is recognized as the most vulnerable country in the world to natural disasters, including cyclones, earthquakes, tsunamis and the impacts of climate change are exacerbating the frequency and intensity of extreme weather events. Establishing the appropriate legal and institutional analysis will identify and support effective land use planning and construction that will redirect urban growth to safe and sustainable areas.
**City Planning Labs**

**PROGRAM GOAL**

Strengthen data-driven and integrated spatial and urban planning in Indonesian cities.

The Municipal Spatial Data Infrastructure (MSDI) foundation is being established in multiple Indonesian cities under the World Bank’s City Planning Labs (CPL) Initiative. The MSDI development is funded by Indonesia Sustainable Urbanization (IDSUN) Multi Donor Trust Fund, which builds upon the pilots carried out in Indonesian cities under a previous KGGTF grant.

This secondary KGGTF funded program will build on the MSDI foundation by addressing the gaps preventing optimal utilization of MSDI for spatial planning. It will enhance community engagement within MSDI and city-level planning systems, with particular focus on inclusion of urban poor. It will improve the sustainability of information generated and systems created under ongoing World Bank investment operations.

Indonesian cities are working to develop digital tools that will support better city-level and spatial planning.
Rio Low-Carbon City Development Program

PROGRAM GOAL
To support sustainable economic growth and implementation of Rio de Janeiro's ISO-certified low-carbon city program.

Spatially constrained and environmentally fragile, the Rio metropolitan area has made the Rio Stage region susceptible to environmental disaster. To support sustainable economic growth and implementation of Rio de Janeiro’s ISO-certified low-carbon city program, two innovative programs are helping Brazil’s second largest metropolitan area to improve social services and decrease environmental degradation. The first of its kind, the low-carbon city development program is providing tools to quantify and track GHG emissions, helping Rio to promote resource efficiency while creating green jobs. The new harmonized approach leverages financial and technical tools to help structure and implement future municipal low-carbon investments.
Green Vision for the Rio de Janeiro Metropolitan Region

PROGRAM GOAL
To build a foundation for long-term sustainable planning and governance.

The green vision for the Rio de Janeiro metropolitan region program aims to build a foundation for long-term sustainable planning and governance. The program provides technical assistance to build urban planning capacity, and develops and disseminates urban green growth knowledge products and lessons learned in partnership with the SMG.

Central America Urbanization Review

PROGRAM GOAL
To develop an analytical framework and policy guidelines for sustainable urban growth built on principles of high density, mixed land use, smart growth, transit-oriented development, and environmental considerations.

To help Ecuador cope with uncoordinated urban sprawl fueled by population growth, the program enhances government capacity to manage green urban planning. The program supports development of an analytical framework and policy guidelines for sustainable urban growth built on principles of high density, mixed land use, smart growth, transit-oriented development, and environmental considerations. Korean experts are sharing their lessons and experiences in urban and transit development, and financing instruments for mixed land use.
Regional Resource Recovery and Recycling

**PROGRAM GOAL**
To develop knowledge products that foster innovation and highlight best practices for policies, technologies, and practices to support and apply green and inclusive growth strategies in the Latin American region’s solid waste and green city initiatives.

Many countries are moving away from disposal-focused approaches to solid waste management by reducing the volume of solid waste through reuse and recycling. The program is developing knowledge products that foster innovation and highlight best practices for policies, technologies, and practices to support and apply green and inclusive growth strategies in the LAC region’s solid waste and green city initiatives. Applying those tools in pilot countries will help enable greening of waste management, benefiting more than 40 projects in a variety of sectors.

Instruments for Urban Redevelopment under the Integrated Sustainable Urban Development Program

**PROGRAM GOAL**
To strengthen intra-urban redevelopment programs through support for a framework and package of incentives, including funding, subsidies, guarantees, access to equity funding, and technical advice.

In Mexico, urban populations over the last thirty years have doubled. Most of the newer urban areas are developed with low-density housing that has resulted in a patched urban development pattern and forced low income families to live in core urban areas. Such urban growth patterns have also resulted in social instability and decaying infrastructure.

To help address unsustainable urban expansion, the Mexican Government initiated the Integrated Sustainable Urban Development program (Desarrollos Urbanos Integrales Sustentables or DUIS)
whose methodology and incentive package are geared towards green field initiatives through smart-growth and sustainable principles. The instruments for urban redevelopment under the DUIS program aim at strengthening intra-urban redevelopment programs through support for a framework and package of incentives, including funding, subsidies, guarantees, access to equity funding, and technical advice.

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**Urban and Housing Programmatic Approach**

**PROGRAM GOAL**

To support the government of Mexico to increase the sustainability and inclusiveness of the urban sector and improve affordability and diversification of the housing market.

Mexico’s 383 cities, home to 78% of Mexico’s population, are engines of economic growth and prosperity, but rapid urbanization through a large spatial expansion, decades-old low-density urban growth, and decaying infrastructure have led Mexican officials to pursue green growth strategies. The urban growth pattern for the last thirty years was a large spatial expansion that led to a low-density development that resulted in inefficient resource use for economic development. Hence it is required to redefine urban landscape to amplify the gain from urbanization and to promote green and inclusive growth.

To support the government of Mexico’s sustainable urban and housing policy priority, the KGGTF program aims to support the government of Mexico to increase the sustainability and inclusiveness of the urban sector and improve affordability and diversification of housing market. Such efforts will facilitate to incorporate a set of activities to inform policy reform, design and implement instruments for sustainable and inclusive cities and foster learning and knowledge sharing.
Implementing Green Solutions for Waste Management in Argentina

**PROGRAM GOAL**

Produce options to help authorities make strategic decisions, policies, and investments in relation to solid waste management.

Regional initiatives have already reduced open dumps in Latin American countries by an estimated 20% in the last decade. KGGTF’s two-year program is providing technical assistance to review global case studies and select best practices in greening solid waste management. Working with Colombia and Argentina, the program team will produce options to help authorities make strategic decisions, policies, and investments. The program will also help countries put lessons learned into practice. This includes improving data resources for solid waste management, creating national green solid waste management investment programs, modeling management packages, creating source segregation and collection systems, and providing training for food waste management.

**Argentina** is working to improve its solid waste management policies and programs. Recent regional initiatives have already reduced open dumping by 20%.
## Strengthening Capacity for Integrated Solid Waste Management

**REGION**  
Latin America and the Caribbean

**COUNTRY**  
Mexico

**SCALE OF IMPACT**  
National

**TECHNICAL AREAS**  
SWM, Landfill Closure and Remediation

**KGGTF PROGRAM YEAR**  
3

**STATUS**  
Completed

**PROGRAM GOAL**  
Provide technical and financial support to develop a national integrated solid waste management plan for Mexico.

Comprehensive and integrated solid waste management is one of the major challenges in Mexico affecting overall sustainable development and green growth potential. According to the National Basic Analysis for Integrated Waste Management, approximately 37.5 million tons of municipal solid waste is generated every year. Another challenge is the adequate treatment and disposal of more than 84 million tons of waste requiring special handling and 1.9 million tons of hazardous waste. Unfortunately the burden of pollution and public health risks associated with inefficient solid waste management falls on the extreme poor. In this green growth implementation program, the World Bank and KGGTF will provide technical and financial support to develop a national integrated solid waste management plan.

## Inner City Affordable Housing Program in Mexico

**REGION**  
Latin America and the Caribbean

**COUNTRY**  
Mexico

**SCALE OF IMPACT**  
National

**TECHNICAL AREAS**  
Affordable Housing, Slum Upgrading, Urban Regeneration

**KGGTF PROGRAM YEAR**  
3

**STATUS**  
Completed

**PROGRAM GOAL**  
Limit urban sprawl in Mexico in order to protect the environment and poor populations.

Nearly 84% of economic activity is produced in urban areas. Therefore maintaining sustainable cities is key to Mexico’s environmental and economic health. Rapid urbanization threatens to increase pollution and alienate the poor.

This green growth implementation program will support Mexico’s Inner-City Affordable Housing Program as it tries to reform national housing subsidies to align with smart urban development. The program will finance urban renovation programs in inner-city areas that prioritize affordable housing in mixed use and transit-oriented areas. The end result: a feasible framework for implementing urban renovation in Mexico.
Greening Urban Growth in Metropolitan Buenos Aires

PROGRAM GOAL
Support the Argentine Government to implement policies and investments to improve regional disparities and promote integrated infrastructure and transport planning.

Argentina is a country of cities, with 90% of its population living in urban areas. However, the country has yet to experience the benefits of urbanization. Urban sprawl and the large volume of informal settlements means that many citizens are unable to move efficiently and access economic opportunities.

This KGGTF funded program will support the development of preparatory and structuring studies of key infrastructure components to upgrade and redevelop the Regional Express Passenger Railway Network (RER) for the Metropolitan Area of Buenos Aires. This comprehensive strategy will set the framework to redevelop the transportation infrastructure by intensifying and improving the connectivity of the entire network. In particular, the plan will include the building of new tunnels, stations, overpasses, electrification of key lines, new rolling stock and multimodal transfer facilities. Key elements of the strategy will be substantial GHG emission reductions and improved access to transportation and jobs for 40% of urban residents.

This program will additionally examine potential solutions to triple the current participation of rail cargo by assessing alternatives such as dry ports connected by road and rail. Argentina is committed to replicating successful projects from Buenos Aires to other cities across the country. Because of Seoul’s expertise in bus-based public transport and non-motorized infrastructure, the Government of Argentina is further interested in support for the creation of preparatory studies for scaling up bicycle paths, pedestrian corridors and establishing an additional 20 Metrobus corridors. It is expected that successful projects will be replicated throughout other cities in Argentina and across Latin America.
Transport and logistics are often considered the ‘backbone of a country’s economy’. The policy framework, financial decisions and new types of labor skills needed to build, operate and maintain a high-functioning transport system require an integrated approach and long-term thinking.
With a population of 3 million, and growing 4% per year, Addis Ababa faces rapid urbanization that strains its infrastructure and services, posing serious challenges to the city’s development, and to quality of life for its citizens. The main barrier the city faces in addressing this challenge is the serious lack of experience in urban planning at both the leadership and technical levels. Therefore, critical to the city’s growth is the development of human resources and capacity through practice-based training.

**GREEN GROWTH STRATEGIES**

The World Bank Group and KGGTF support the City Government of Addis Ababa as they establish a long-term master plan for urban development and transportation, and a comprehensive series of training and capacity building programs to build the necessary professional and technical capability internally to oversee the city’s transformation.

The program that was developed brings together the Addis Ababa and Seoul municipal administrations along with the University consortium of Addis Abba, University of Seoul, and Seoul Metropolitan Government. The program also facilitates Korea Transport Institute (KOTI) training programs on public bus systems, transport strategies, and related issues for stakeholders, including the Addis Ababa Road and Transport Bureau.

**KGGTF SUCCESS STORY**

**Integrated Urban Planning for Addis Ababa**

**CONTEXT**

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“Seventeen cabinet members from Addis City Government made a trip to Seoul. It resulted in a partnership with Seoul Metropolitan Government and Seoul University for long term capacity building across land management, housing, solid waste management and urban planning. The World Bank facilitated this collaboration to find specific solutions for Addis Ababa together.”

ABEBAW ALEMYEHU,
SENIOR URBAN SPECIALIST, WBG, ADDIS ABABA

“Capacity building is important to ensure a proper future. In this area we are getting lots of support from Korea and in particular from Seoul Metropolitan Government, Seoul University and the KGGTF. On behalf of my city we would like to thank you. To see the green programs in Korea has made an enormous difference in our city.”

H.E. ATO ABATE SITOTAW,
DEPUTY MAYOR, CITY GOVERNMENT OF ADDIS ABABA
**KGGTF SUPPORTING SOLUTIONS**

This KGGTF project took a comprehensive, multi-disciplinary approach to addressing the city’s urban planning challenges. Specific components of the capacity building and strategic planning program included:

- Feasibility study
- Knowledge Exchange learning activities
- Technical workshops
- Development of a long-term master strategy and implementation plan
- Educational partnership between government and higher education institutions to support long-term capacity building
- Intensive training course for 23 young professionals at the University of Seoul
- Engagement with key stakeholders
- Analysis of the potential role of industrial parks in Addis Ababa
- Governance and policy analysis and recommendations

**TRUST FUND IMPACT**

On the basis of outputs and technical assistance developed under the trust fund activity, a restructuring of Addis Ababa urban transport governance has been implemented and accomplished. Trust fund resources provided operational investment for implementing green growth provisions of the transport master plan.

The trust fund enabled the Addis Ababa City Mayor and his cabinet members, totaling 17, to acquire valuable knowledge and experience through a comprehensive study tour visiting their Korean counterparts. The study tour opened up an opportunity for the city of Addis Ababa to sign a Memorandum of Understanding with Seoul Metropolitan Government, and between the University of Civil Service of Ethiopia and the University of Seoul. This engagement led to capacity building training for 23 young professionals from Ethiopia at the University of Seoul. These professionals have become instrumental in the implementation of the newly completed and approved Addis Ababa Master Plan.
Collaborations/Partnerships

SEOUl
- SEOUL METROPOLITAN GOVERNMENT
- UNIVERSITY OF SEOUL
- THE KOREA TRANSPORT INSTITUTE (KOTI)

ADDIS ABABA
- CITY GOVERNMENT OF ADDIS ABABA
- UNIVERSITY CONSORTIUM OF ADDIS ABBA
- ADDIS ABABA ROAD AND TRANSPORT BUREAU

Capacity Building

Urban Pattern
Land Development Strategy
Land Use Management
Housing Supply and Upgrading

Transport System and Traffic Management System

Solid and Liquid Waste Management System

Integrated Infra Supply including Water, Energy, Communication
Capacity Building for Leaders in Energy Efficient Urban Transport Planning

PROGRAM GOAL
To help connect, share and develop technical capacity among leaders, including senior decision makers who influence urban transport policies, to apply green transport principles and methods to promote economic growth.

Cities are important engines of economic growth, but rapid urbanization also can cause severe congestion, poor air quality, increased road accidents, and rapid increases in energy consumption. Transportation is a critical issue that affects people’s health, economic prospects, and well-being—and the sustainability of cities. The program aims to help connect, share and develop technical capacity among leaders, including senior decision makers who influence urban transport policies, to apply green transport principles and methods to promote economic growth.
Global Greenhouse Gas Transportation Diagnostic Model

PROGRAM GOAL
To develop a green growth transportation diagnostic model to support countries design or restructure their transportation system.

Transportation by freight accounts for nearly 50% of global transport greenhouse gas emissions (GHG). The ability for countries to improve efficiencies in their transport system will dramatically support the reduction of GHG. This program will evaluate and then develop a clear and actionable diagnostic model to improve efficiencies in the trucking sector. By assessing and quantifying the relevant levers the government has including such things as — policy reforms, public-private partnerships, infrastructure investments, private carriers’ and shippers’ ability to optimize fleet use, the impact of fuller loads and larger trucks — the model will provide countries the tools to develop customized green growth transportation solutions.

The transportation model will include such elements as: guidance on identifying key policy and investment barriers to trucking sector efficiency and a diagnostic tool to assess potential GHG gains from trucking efficiency. Once established, the WBG and KGGTF envision designing comprehensive training materials to incorporate trucking sector efficiency considerations into the WBG roads GHG accounting methodology.
Reducing Greenhouse Gas Emissions for Rail Freight in Central Asia

PROGRAM GOAL
Reduce greenhouse gas emissions by assisting Central Asian governments to develop solutions to transfer shipping to rail.

Transportation of imports and exports continues to rise across Central Asia. Government officials would like to create appropriate policy incentives and strategies to shift transport and logistics to rail in an effort to bring emissions down.

This Korea Green Growth Trust Fund program will help Central Asian government agencies partner with the Korea Transport Institute to conduct comprehensive greenhouse gas (GHG) and pollution estimates of rail networks and recommendations for GHG reduction strategies related to rail construction and operations.

The resulting GHG railway analysis will support the World Bank’s growing portfolio in the railway sector of various countries, including Kazakhstan, Uzbekistan, Turkey, Tajikistan, Croatia, China, Vietnam, Bangladesh, and India, and contribute to World Bank lending efforts in sustainable transportation networks.

Establishing rail as a key method for logistics across Central Asia will reduce greenhouse gas emissions and improve traffic for citizens. Developing an extensive network of cost-effective transport will further support economic integration and opportunity throughout the region.
Developing Skills to Support Transport and Logistics in Sub-Saharan Africa

**PROGRAM GOAL**
To assess Ugandan skills needs in transport and warehousing, including jobs emerging from implementation of green technologies.

Increasing the competitiveness of logistics sectors to transport vast oil, gas, and mineral resources is a critical factor in shaping green growth strategies in many countries. Working with the Ugandan Government, KGGTF is providing technical assistance to improve African competitiveness. The program is assessing Ugandan skills needs in transport and warehousing, including jobs emerging from implementation of green technologies. The program is also developing a regional methodological framework for assessing skills needs and supply as countries increasingly incorporate green methods, such as retrofitting and maintaining hybrid vehicles for urban transport.
Africa Sustainable Transport Forum

PROGRAM GOAL
Share knowledge and tools to help Africans create and implement policies and programs that support regional, national, and city strategies.

Poor intra and inter-regional connectivity severely constrains Africa’s development. Traditional transport programs rely on major infrastructure investments, but Africa needs sustainable transport systems that address connectivity while promoting inclusive, shared prosperity. The KGGTF’s three-year Africa Sustainable Transport Forum (ASTF) program aims to provide African cities with tools to foster resilient and sustainable green growth transport policies—policies that encourage environmentally sound, low-carbon, inclusive, transport solutions. The KGGTF program is providing technical assistance and Korean experience consistent with World Bank initiatives as well as Rio+20 commitments to provide USD $175 billion for sustainable transport projects globally over 10 years.

The program will share knowledge and tools to help Africans create and implement policies, programs, and demonstration pilots for regional, national, and city strategies. The tools include African public continental data and statistics: a non-motorized transport training and policy toolkit pilot in Uganda; and an investment cost-benefit analysis tool that considers environment, road safety, and accessibility. The program will also support the development of policies to reduce particulate emissions from heavy-duty diesel vehicles, and help facilitate access to funding. The program will present Korean examples of successful transport initiatives at workshops in 2015, and at the 2016 Action Plan for Sustainable Transport in Africa Conference.
**Streets as Drivers of Green Growth and Urban Prosperity in Sub-Saharan Africa**

**PROGRAM GOAL**
To increase safety, reduce travel time, and improve access to socio-economic services.

In many cities the inhabitants take 40-60% of all trips by walking to public transportation. Pedestrian space is often not separate from the road, and walkers compete with street vendors, shops, parked cars, motorcycles, and bicycles. Government statistics rarely measure the pedestrian environment, which cause leaders to neglect it in plans and policies. Pedestrian unfriendly cities tend to affect most negatively the economically and socially excluded, the people least likely to have access to efficient motorized transport. To promote sustainable urban prosperity and green growth, the program aims to increase safety, reduce travel time, and improve access to socio-economic services. The program assesses and improves pedestrian access and connectivity in the three selected African cities: in Dar es Salaam, Tanzania; Kampala, Uganda; and Abidjan, Ivory Coast.

**Green Logistics and Strategy in Uganda**

**PROGRAM GOAL**
Support the development of a comprehensive logistics and green growth transportation sector in Uganda.

This second KGGTF Uganda transport grant supports the development of a logistics strategy that will lower greenhouse gas emissions, reduce costs, create jobs and increase economic growth and stability. Refreshed funding will identify next-steps for Uganda on how to build a transportation sector through: support of logistics and shipping companies, industry growth through regulatory reform and policies, appropriate tax incentives, emissions-reduction schemes, educational partnerships, and research and development.

This partnership, primarily with the Korea Transport Institute, will serve as a framework for other World Bank programs in Africa and South Asia.
**PROGRAM GOAL**

*Fund digital development solutions in Tanzania across multiple economic sectors.*

Under its Tanzania Development Vision, the Tanzanian government aspires that by 2025 the majority of the country’s citizens will earn middle incomes, and have access to education, sustainable economic opportunity, security, and peace. This KGGTF grant will provide funding to evaluate new transportation business models that reduce congestion and emissions and support new jobs and green economic growth. By deploying unmanned aerial vehicles it will facilitate improved mapping, surveying, flood response, environmental management, and risk assessment. Program activity will include a transport infrastructure and mitigation assessment of Dar es Salaam to evaluate new transportation business models that reduce congestion and emissions and support new jobs and green economic growth.

The data uncovered in this program will inform the design of World Bank-funded projects and flood risk reduction strategy in the Msimbazi River Basin in Dar es Salaam. It will support World Bank funded climate technology innovation projects and green growth in Tanzania, while addressing rapid urbanization and youth employment challenges.

*Dar es Salaam* is rapidly expanding. The Tanzanian government is evaluating new transportation models to reduce congestion and emissions while supporting new job creation and economic growth.
Transportation Resilience in Ethiopia

PROGRAM GOAL
Build on the findings of a 2010 study by supporting climate resilience in Ethiopia including the maintenance of existing major roads and bridges managed by the Ethiopia Roads Authority (ERA), and a review of the new ERA infrastructure design.

Prior to action, a vulnerability assessment of core transportation corridors will inform prioritization of maintenance and construction based on flood risk, the availability of alternative routes, and minimizing transportation disruptions. Possible solutions to Ethiopia’s transport challenges could include, technology modifications that can better withstand high temperatures, improved drainage, and protection against erosion. Critical to a new road system will be robust data collection and information systems that can warn of potential problems. The program will support Ethiopia’s national climate change mitigation agenda through integration of key strategies developed from the ERA’s partnership with the Korean Transport Institute (KOTI).

Results from this program will inform other World Bank projects in Ethiopia including the country’s road sector support project, expressway development support project, and transport systems improvement project.
Greater Beirut Urban Transport Project

**PROGRAM GOAL**

To improve traffic conditions, improve energy efficiency, rationalize transport demand, and reduce GHG emissions in Beirut’s most congested corridor.

About half of the country’s 1.2 million vehicles operate in the Greater Beirut Area, where most citizens travel with private cars. Over half of country’s energy consumption stems from urban transport. The program is conducting a detailed study of Beirut’s most congested corridor to improve traffic conditions, improve energy efficiency, rationalize transport demand, and reduce GHG emissions. Recommended improvements for the corridor will inform authorities’ plans for a new mass transit project, and guide the implementation and scaling of practical solutions to alleviate congestion. The program will also review transport pricing—including gasoline, taxi fares, and tariffs for the planned transit system—as well as review social implications, especially for the poor.
Egypt Green Transport Master Plan and Data Management System to Support Digital Transformation of the Transport Sector and Intelligent Transport Systems

**PROGRAM GOAL**

To develop a Data Management System to support the Development of the Green Transport Master Plan, the Digital Transformation of the Transport Sector and Intelligent Transport Systems in Egypt.

Cairo is one of the five most congested and polluted cities in the world. It accounts for 25% of Egypt’s population and half of its GDP. A World Bank study estimated the costs of congestion in the Greater Cairo Metro Area at 3.6 percent of the country’s GDP. While the Government of Egypt is investing in mass transit transport projects, rapid urban and population growth and increasing motorization warrant the development of a comprehensive strategy to enhance the economic competitiveness of the metropolitan area and the country itself.

This project aims at collecting data to develop a Green Transport Master Plan and a crowdsourcing, multi-platform, integrated big data system for tracking traffic, congestion, and accidents in Egypt, starting with the Greater Cairo Region. The data system will support the planning and regulating of urban traffic and development plans. Currently, no agency is systematically collecting urban traffic data, despite the extensive congestion, especially in the Greater Cairo Region.

The team responsible for the execution of this activity will partner with the Korea Transport Institute (KOTI), the Korean Energy Agency (KEA) and the Green Technology Center-Korea (GTC-K) to share results, build on existing knowledge on Urban Transport Planning, and leverage digital technologies for Smart Cities development and management.
Promoting Climate Resilience to Sustain National Transport Systems

PROGRAM GOAL

To support the Moroccan Ministry of Transport to analyze green transport technologies and assess critical road sections, while providing examples of good green transport options.

Climatic events can create major disturbances to economic activity resulting in substantial direct and indirect consequences. This KGGTF program will support the Moroccan Ministry of Transport to analyze green transport technologies and assess critical road sections, while providing examples of good green transport options. The program will produce technical recommendations that reflect climate resilience measures to sustain national transport systems. The technical audit and assessment examines vulnerability to climate variables, including intense precipitation, flooding, and landslides, as well as structure and substructure, hydraulic works, geotechnical characteristics, and alignment. The assessment will propose detailed cost effective solutions for rehabilitation and maintenance work, which could include use of different materials, slope stabilization techniques, revision of dimensioning hydraulics, and use of vegetation for slope stabilization.
Piloting Green Transport Solutions for City Transit Authorities

PROGRAM GOAL
To improve public transport management in cities where newly established transit authorities want to improve inter-municipal coordination, increase the use of public transportation, and encourage city level CO2 emission accounting.

Energy efficient measures and integrated transport networks support sustainable development in cleaner and greener cities and regions. The program aims to improve public transport management in cities where newly established transit authorities want to improve inter-municipal coordination, increase the use of public transportation, and encourage city-level CO2 emission accounting. The program will incorporate Korean experience with reducing transport CO2 emissions in line with European Union energy and climate guidelines for sustainable urban mobility.
**REGION**
Europe and Central Asia

**COUNTRY**
Georgia

**SCALE OF IMPACT**
National

**TECHNICAL AREAS**
Low Carbon Freight, Transport & Logistics, ITS

**KGGTF PROGRAM YEAR**
1

**STATUS**
Completed

**PROGRAM GOAL**
Support Georgia to develop a national strategy for freight transport and logistics using green logistics for road-to-railway and multimodal freight corridors.

Georgia remains heavily reliant on imported energy to meet its transportation needs, and road transport is a significant contributor to the country’s air pollution. Georgia’s post-conflict strategy includes using green growth strategies to improve transport connectivity and increase private sector efficiency and trade. The program includes exploring policy and investment options to “green” freight transportation by increasing use of cleaner, lower-carbon transportation modes, such as fuel-efficient and low-emission trucks. The program is helping Georgia develop a national strategy for freight transport and logistics using green logistics for road-to-railway and multimodal freight corridors. The program supports the client in developing an investment program for the freight corridors, strengthening fiscal and pricing measures, and improving collaboration with key trade partners. Expected results include creating an implementation timeframe, evaluating technology and trans-shipment options, strengthening technical institutions, developing logistics centers, and expanding container terminals and other cargo-handling capacity.
Sustainable Urban Transport for the City of Kyiv

**PROGRAM GOAL**

To support Kyiv’s City Development Strategy through enhanced traffic management and improved urban mobility to strengthen the city’s economic competitiveness.

Kyiv, the capital of Ukraine and the 8th largest city in Europe, faces a number of urban transport challenges. Public transport systems—including metro, municipal and private buses, trams, and trolley buses—operate often near capacity on poorly maintained, Soviet-era legacy systems. The city’s transportation infrastructure has deteriorated due to lack of investment and weak system integration. Furthermore, city plans do not reflect spatial expansion of the city, the growing use of motorized vehicles, and changing passenger mobility patterns. Traffic congestion has increased travel time and costs, traffic accidents, while contributing to deteriorating air quality and declining productivity. The City Development Strategy identified transport as a top priority, pointing to enhanced traffic management and improved urban mobility as key to strengthen the city’s economic competitiveness. To support Kyiv’s City Strategy, the program i) assesses and benchmarks the city transport systems; ii) recommends improvements in public transport; iii) strengthens city administration transport planning capability; and iv) develops an integrated city traffic management scheme.
Green Truck Initiatives Through E-Tolling and ITS in Kazakhstan

**PROGRAM GOAL**

Support Kazakhstan to plan design and implement an e-tolling strategy that supports a move to a broader green growth strategy.

The government of Kazakhstan's aims to be a critical transportation and logistics hub for Central Asia while aligning its transportation goals with its green economy plans.

The advantages of e-tolling are widely recognized and have been successfully implemented in countries around the world. The strategy: to evaluate individual vehicle emissions and charge more per kilometer for trucks with higher GHG emissions provides incentives to switch to cleaner vehicles. A recent study from Korea shows e-tolling can reduce GHG emissions by 40%.

This grant will provide technical assistance to design, plan, and implement an e-tolling strategy. It will support a financial and environmental cost-benefit analysis of e-tolling technical and tariff options, and analysis of the necessary legislative and institutional frameworks for implementation. It will furthermore develop an emissions monitoring system. By partnering with key transportation agencies in Korea, the Kazakhstan government will set the foundation for long-term knowledge sharing and turns its green growth strategy into a reality.

The proposed activities are aligned with the World Bank and KGGTF’s goal to respond to client demand for technical green growth operations. The analysis, framework technology and solutions developed in Kazakhstan have the potential to be an important element of green logistics for World Bank clients globally.
**Green Logistics in the Ukraine**

**PROGRAM GOAL**

Support development of a sustainable logistics strategy that effectively utilizes cleaner transportation modes with a focus on railways, roads, and waterways.

Ukraine is in a fragile economic and political state and is re-evaluating how to secure its long-term financial and environmental wellbeing. One key to unlocking the country’s potential is re-envisioning transportation logistics. Ukraine is a key link between Asia and Europe and is the world’s third largest grain producer. Currently nearly 75% of freight transportation through the country happens via truck traffic.

A detailed analysis of road, rail, inland waterways, and urban ports will examine the role of government, environmental impact, climate resilience, and economic competitiveness and deliver a priority list of transportation projects. KGGTF funding will evaluate regulatory and legal barriers to implementation and enforcement, cost analysis (financial and environmental), benchmarking logistical performance, and assessing and building institutional capacity. The end product, a national logistics action plan, will guide and monitor the implementation of a new transportation and green growth path for the Ukraine.

**Ukraine** is exploring the best approach to unlocking the country’s economic potential by expanding its capacity in freight transportation between Asia and Europe.
**Greener Connectivity for Six Countries in Southern Caucasus and Eastern Europe (Eastern Partnership)**

**REGION**
Europe and Central Asia

**COUNTRIES**
Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine

**SCALE OF IMPACT**
Regional

**TECHNICAL AREAS**
Green Transport Strategy and Policy, Supply Chain, Freight Logistics

**KGGTF PROGRAM YEAR**
5

**STATUS**
On-going

**PROGRAM GOAL**
To promote green investment in transport connectivity and support the SIC countries in the Eastern Partnership to develop a green connectivity advantage that delivers improved outcomes on energy efficiency and transport sustainability.

Six countries in the Southern Caucasus and Eastern Europe including Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine, are engaged in a joint initiative to improve connectivity, and to promote transport and infrastructure connections and increased mobility of passengers and goods. Recent increases in commodity prices and fluctuations in energy prices have further revealed the technological and structural weakness of these economies' transport and connectivity systems, presenting an important opportunity for green freight and passenger transport.

This KGGTF grant will support the development of an assessment model across the six countries, as well as an impact assessment of a number of green connectivity measures, the preparation of a user-friendly assessment tool, and the consideration of innovative financial instruments to implement those measures.

Transforming the current system into a low-carbon, more energy-efficient and eco-friendly one will generate more opportunities for green growth and ultimately promote sustainable economic growth and development.
Promoting the Use of Green Construction Technology in the Road Sector

PROGRAM GOAL
To share knowledge about options and innovative materials based on successful examples from Korea and other countries.

India has been implementing its large road infrastructure program since 2000. KGGTF is supporting the use of green construction technology in the road sector to address the urgent need for sustainable construction practices. Traditional low-productivity construction technologies use a great deal of energy and emit a great deal of GHGs, and materials such as sand and gravel deplete natural resources. The program shares knowledge about options and innovative materials based on successful examples from Korea and other countries. The program directly contributes to a road modernization project in Rajasthan that will bolster the local rural economy by improving transit connectivity in remote rural areas. Among options, mineral-rich Rajasthan state will save money and create local “green” jobs by building roads using its large quantities of quarry waste and materials such as fly ash and low-cost concrete. The program is organizing a workshop for officials from the Ministry of Road Transport and Highways, India’s National Highway Authorities, National Rural Roads Development Authority and Rajasthan’s Public Works Department. The program will then pilot a selection of green options for at least 10% of roads that India’s national program will build.
Green Transport Initiative in Bhutan

**PROGRAM GOAL**
To help improve urban transport in Thimphu, Bhutan’s capital and largest city.

Bhutan is a low-income country with a USD $2,400 per capita GDP, but GHG emissions are increasing along with vehicle ownership. Fossil fuel, food, and other imports consume much of the nation’s foreign exchange earnings. The Government of Bhutan aims to make the country self-reliant, improve its balance of payments, and make the country inclusive and green. Along with plans to expand hydropower generation, Bhutan would benefit from better energy use efficiency, and by decreasing the use of non-renewable fuels.

The KGGTF’s two year program will help improve urban transport in Thimphu, Bhutan’s capital and largest city. The program will provide green growth case study examples of transport systems that can lower emissions for the city’s 100,000 citizens. Cost-benefit analysis and technical assistance will help operationalize green transport, including introducing low-emission buses citywide. The program will also present a roadmap for electric vehicle implementation, including short and medium-term investment in vehicle charging stations. Improved public transportation and travel efficiency, including enabling walking and cycling, will benefit the poor, while creating a new model for national economic growth, enhancing national competitiveness and promoting tourism in Thimphu. The program is also working with a number of other partners, including Green Technology Center Korea (GTCK) and the United Nations Development Programme (UNDP).
Technical Assistance for Smartcard Integration for Better Connected Public Transport System in India, Bangladesh and Bhutan

Program Goal
To demonstrate the benefits of integrated smartcard systems.

As cities start to operate new modes of public transportation, it is common for each transit system to have incompatible fare collection smartcards. This World Bank KGGTF funded green growth implementation program will assist cities in India, Bangladesh, and Bhutan install an integrated and efficient smartcard system. Research will investigate the status of transport ticketing in several South Asian countries and the status of available smartcard technology. In the end, new standards will be tested in three pilot programs in an effort to set examples of higher quality transportation service that is more efficient and more integrated with land use, urban development, and green growth.

Smartcards provide the opportunity for seamless intermodal transportation transactions. The financial transparency encourages shared governance between public and private organizations.
Kolkata Metropolitan Transport Efficiency Improvement in India

**PROGRAM GOAL**

To integrate multiple transport systems and reduce congestions in the Kolkata Metropolitan Area (KMA).

The population in the KMA has exploded since India won its independence. In 1947 there were just 0.6 million residents, compared to the projected 21 million by 2025. The city continues to struggle and manage this growth. KMA, unlike other mega cities in India, has a large number of public transport modes, from rickshaws and buses to trams and ferries. It is the integration of these systems and decongestion of the KMA that is the focal point of this green growth implementation program.

Funding will go toward researching low-carbon solutions through a combination of smart urban planning, technology use, bus reform, pricing policies, and open space and land use planning. Once these factors come together, service will improve and the city will become more livable and grow in a sustainable way. It will also allow for the transfer of knowledge on what works and what doesn’t with respect to design, phasing, and implementation of green development initiatives, including policy reforms, investments, and private sector engagement.
Innovative Financing for Intelligent Transport Systems in Indian Cities

**PROGRAM GOAL**

Bring efficient, resilient, reliable and affordable transportation to nine Indian cities.

This green growth implementation program will help to modernize bus service in nine Indian cities, making public transportation more reliable, affordable, safe, and environmentally friendly. Funding will support smart urban planning through Intelligent Transport Systems and private-public partnerships. It will also support development of competitive pricing policies and social marketing, as well as foster knowledge sharing with Korea and China. A more efficient transport system will help increase capacity, and prepare cities for natural disasters and the longer-term effects of climate change, all while helping Indian cities grow—economically, technologically, and socially.

**Bus Rapid Transport (BRT)** systems are an effective way to increase rider capacity and decrease commuting times. Indian cities are working to find long term transportation solutions that will be resilient to the effects of climate change.
Achieving Green Growth through Green Transport and ICT

PROGRAM GOAL
Support the development of an open-source transportation platform, along with the technical capacity to support the adoption and ongoing maintenance of the platform.

With safer and more efficient transportation networks, people living in large cities benefit from reduced travel times, accidents, and emissions. Linked to a road safety data-collection-and-analysis platform, this program promotes innovative approaches to build the capacity of transport agencies to use the data platform to improve transport planning and management. The program aims to strengthen sustainable and inclusive city growth by helping develop the open-source platform, and will build university-level technical capacity.
Cambodia and Lao PDR: Fostering Green Mobility and Walkable Cities Strategy for Luang Prabang and Siem Reap

**PROGRAM GOAL**
To support municipal authorities of Luang Prabang and Siem Reap in fostering green mobility strategies to preserve both cities’ cultural, historical and economic values.

There is a global consensus that transitioning to greener mobility will be crucial to the overall success of the climate agenda. Many cities are increasingly facing challenges of high motorization and congestion which undermine their sustainable growth, damage living conditions, and increase the environmental footprint. With the rapid pace of urbanization, the concept of green mobility and walkable cities is becoming imperative for inclusive and sustainable growth, creating high demand for design and implementation of green mobility actions.

The proposed activity covers two similar cities of Cambodia (Siem Reap) and Lao PDR (Luang Prabang), that are included on the UNESCO World Heritage list. Both cities are having significant cultural, historical and economic value and both are facing similar development challenges: increased motorization, unplanned land use and disordered transport systems expansion, driven by growing tourist numbers. These problems put their future sustainable and inclusive growth at risk but are also creating an opportunity for learning from each other’s experiences and benefiting from synergies in the application of innovative solutions.

To implement this program the World Bank KGGTF team will work to strengthen and grow partnerships with institutions in Korea, facilitate knowledge exchange and exposure to best practices, and build innovative tools for the two beneficiary cities. Existing partnerships include cooperation with KOTI, SHRDC and the Seoul National University.
Public Transport Development Strategy for Sustainable Urban Mobility in Hanoi

**PROGRAM GOAL**

Support the successful fulfillment of Hanoi’s Urban Transport Masterplan with the aim to reduce GHG emissions, relieve traffic congestion, and provide safe, clean public transport services that improve quality of life and access to economic opportunities.

In Hanoi’s pursuit of promoting sustainable growth and attracting new users to public transport, the government has issued an Urban Transport Masterplan including eight new metro lines, three of which are currently under construction, along with complementary BRT lines. The World Bank recently completed a lending project for construction of the first BRT line in Hanoi. To build on the momentum of this BRT line and continue to promote a shift to increased use of public transport, it is critical that the next mass transit corridor selected for design and construction maximize impact, drawing in the most passengers from less sustainable modes, while providing safe, clean, and efficient access to the city’s job centers.

In order to assess the mass transit corridors that can provide the greatest benefit, this KGGTF program will fund a network-wide accessibility analysis of the proposed mass transit corridors. This analysis will include any potential for bus route rationalization as it fits in with the future mass transit network. The importance of such an analysis is significant in providing decision makers information that enables them to maximize the social, environmental, and economic return on future investments.
PROGRAM GOAL

Improve public transport in Bogota by deploying policies that enable a transition to green growth in urban transport.

Bogota has made impressive transport investments in the past, but current demand has not kept up and the city is looking to embark on extensive investments in creating a more sustainable, clean, safe and human-centered urban mobility and urban space. The city has announced ambitious plans to expand and improve transit options, improve the walking and cycling environment, and implement policies to curb congestion and use of private cars.

This KGGTF funded program will support activities to improve current public transit operations and user engagement and information through ICT. The planning, along with control and monitoring capacities of the public transit agency, the improvement to service plans and route systems of the BRT, user accessibility to the system, information given to passengers and the deployment and use of smart card systems will vastly improve the design of the transit systems.

Technical solutions will be sought to improve the current transit system by finding improvements in the planning of bus dispatch operations along key corridors, improved efficiencies in route plans, and restructuring of routes and priority lanes as well as fare policy changes that incentivize transfers that will decrease travel times. Additional policy solutions to streamline and incentivize intermodal integration will include increasing smart card recharging stations, fare collection contracts, automatic smart card recharging through cellphones, along with new tools developed through passive and open sourced data. Lessons learned in Botoga will inform transit investments in other Latin American countries.
Piloting Electro Mobility in the Integrated Transport System of the Aburra Valley

PROGRAM GOAL
To support the pilot service of BRT Line 1 and 2 electric buses in the Integrated Transport System of the Aburra Valley (SITVA), including recommendations for creating a new bus operator for the corridor of Colombia.

Urban transport highly impacts the entire transport sector—the mobility of people and goods accounts for approximately 23 percent of CO2 emissions from fossil fuels, and 15 percent of global GHG emissions. The long-term partnership between the World Bank and the Government of Colombia will support a radical change towards decreased emissions and fossil fuel use in the sector. This partnership has helped Colombia, and particularly SITVA, lead the way in urban transport and become internationally known for innovation.

This KGGTF grant supports the program in its use of mainstream green growth strategies and desire to influence government expenditure and investments in future infrastructure. This grant will also support the systematic use of technical and operational know-how.
Traffic congestion has a substantial impact on both the quality of life and economic opportunities available to the poorest members of society. Lower-income communities tend to rely on public transit and bus networks frequently affected by congestion. Congestion exacerbates pollution and GHG emissions and has a substantial negative impact on urban GDP growth. Given the accelerating growth of major cities across the East Asia Pacific region the impact on urban mobility is severe.

Most congestion solutions were produced for cities in developed countries where technical and financial resources are available to operate and maintain these systems. But, in developing countries, the foundation for traffic management is missing. Disconnected and malfunctioning sensors and monitoring equipment make real-time monitoring impossible. Introducing first-world ICT solutions in third-world contexts has proved expensive and ineffective.

**GREEN GROWTH STRATEGIES**

Effectively compiling and analyzing congestion patterns from traffic data allows for the development of traffic management tools based on algorithms that cities can use to implement real-time, dynamic traffic control measures, such as traffic signaling and deployment of public transit vehicles to specific locations. The result? Encouraging transit use among citizens, easing traffic congestion, decreasing travel times and reducing GHG emissions and the impact of climate change.
Maintaining traffic flow by adjusting traffic signals dramatically reduces traffic congestion. Reducing congestion lowers emissions and journey times in and around the city, and improves quality of life for city residents.
KGGTF SUPPORTING SOLUTIONS
The World Bank Group and KGGTF connects to the World Bank’s Big Data Challenge, and is working with local governments to provide traffic management agencies with open-source, web-based tools for historical travel time analyses and real-time travel speed monitoring. The project builds upon a successful pilot activity in Cebu City where a proof of concept for creating an open-source platform that uses GPS data generated by taxi drivers’ mobile phones to derive meaningful traffic statistics for use in planning and analysis.

INNOVATIVE SOLUTIONS
The recent emergence and rise of ride-sharing apps as transport services for city inhabitants has created an opportunity based on the extensive data they collect and maintain, which includes millions of GPS points. This means that traffic management applications can be developed based on GPS data instead of expensive, fixed-location equipment. The result? Traffic management solutions that can be applied across hundreds of cities, without specialized local equipment installation.

Pilot Project
For this pilot, a partnership was brokered with www.grab.com, the largest ride-sharing app in the Asia Pacific region with 850,000 drivers operating in Malaysia, Singapore, Indonesia, Vietnam, the Philippines, Thailand and Myanmar. This partnership provided access to a large volume of data based on speed, distance traveled and time taken that could be analyzed to produce traffic flow patterns and intersection performance metrics such as delays and wait-times at traffic lights. Based on these metrics a traffic signal plan adjustment methodology was developed.

SMARTPHONES AS “TRAFFIC PROBES”
Over a third of the world’s population use smartphones. GPS signals from smartphones provide a sensor network that:

✔ is not limited to specific corridors
✔ is updated in real time
✔ does not require maintenance or upkeep
✔ provides a level sampling not achievable through manual methods

DATA FROM SMARTPHONES
ANALYSIS OF TRAFFIC FLOW PATTERNS
With KGGTF funding we were able to implement this highly-innovative and technology-driven project, partnering with multiple public and private organizations to cooperate and share Big Data—the resource most critical to 21st century social and economic development.

HOLLY KRAMBECK, SENIOR TRANSPORT ECONOMIST, WORLD BANK GROUP

**OPEN TRAFFIC** Platform combines information from:

- **REPORTER** Software for translating raw GPS data into anonymized traffic statistics
- **OPEN TRAFFIC** graphical user interface for government agencies and the public to easily query
- **THE DATA STORE** a global repository and API for anonymized traffic statistics

**TRUST FUND IMPACT**

**Reducing Emissions at Scale**

Real time speed and observation data from Grab’s fleet of drivers allows for the monitoring of stop and start traffic flows and avoid congestion. This results in reduced journey times that in turn lower GHG emissions. In addition to the positive environmental impact of lowering polluting emissions, achieving faster commute times has social and economic benefits for quality of life and economic growth.

**Carbon Finance Program**

Maintaining the free-flow of traffic by adjusting traffic signaling may be a small step, but when dealing with millions of cars it can have a dramatic impact on traffic build up and on the environment. Taking real-time speed data sets from drivers on a specific corridor and mapping that against the volume of vehicles detected through high-res satellite imagery can determine the fuel economy of vehicles and therefore the level of GHG emitted. This ability to measure emissions accurately for the first time in the region means that even small reductions in emissions resulting from improved traffic flow can be measured, and countries can use these metrics to apply for carbon financing.

“With KGGTF funding we were able to implement this highly-innovative and technology-driven project, partnering with multiple public and private organizations to cooperate and share Big Data—the resource most critical to 21st century social and economic development.”
ICT is impacting every sector by introducing new technology driven solutions. Strategic planning and innovative thinking can also bring new forms of governance structures.
ICT

LATIN AMERICA AND THE CARIBBEAN
2 PROGRAMS

EUROPE AND CENTRAL ASIA
1 PROGRAM

AFRICA
2 PROGRAMS

SOUTH ASIA
1 PROGRAM

AFRICA
2 PROGRAMS

EAST ASIA AND PACIFIC
2 PROGRAMS

GLOBAL
1 PROGRAM
Kosovo’s high rate of unemployment has averaged 41.5% from 2001 until 2016. Due to structural bottlenecks, both cultural and policy related, only one in eight females are able to find employment, with job creation especially constrained in rural areas of Kosovo. In these areas the transition from an economy based on agriculture to a service-based economy is hampered by poor telecommunications infrastructure. A significant number of households are without broadband internet coverage and communities lack digital skills. In light of this, the Government of Kosovo has set a clear goal to create better and more inclusive economic opportunities in rural areas with the help of information and communication technology (ICT).

Recognizing broadband connectivity as one of the enabling infrastructures for green growth, as well as its potential to transform the job market, the Government of Kosovo requested support from the World Bank in 2014 for the design of a broadband program modeled on viability gap funding programs to improve high speed broadband coverage in target rural settlements. By focusing interventions on broadband connectivity, policymakers seek to spur significant economic, environmental and social benefits, including income generating and work opportunities for unemployed rural inhabitants.

From 2015 to 2017 the World Bank KGGTF funded a technical assistance activity aimed at improving access to high speed affordable broadband internet services in underserved rural areas of Kosovo, as a platform for enabling innovative green growth in the country. As a result, a rigorous rural broadband program was designed, based on detailed feasibility
Lira Arifi (on the left in the photo above), a 26-year-old Kosovar with a background in education had been looking for a job for months until she applied for the WOW pilot training “I learnt many things which I did not know even existed, such as online employment”. Lira now works online full time, offering virtual administration and digital marketing services to a US firm. Since March 2016 she has earned $6,000, while also family and friends to access online work opportunities. Lira’s earnings already exceed average annual earnings for full time workers in Kosovo.
studies and international best practices. In addition, the World Bank devised and implemented a pilot ‘green jobs’ intervention to demonstrate the importance of broadband internet for inclusive job creation. The intervention, called the Women in Online Work (WOW) program supported 150 women living across five rural and urban municipalities to learn the technical and soft skills to engage in IT-enabled jobs offered through a global online work marketplace.

TRUST FUND IMPACT

The WOW pilot program is among the first of its kind, both for the World Bank and globally. It demonstrates that with modest investment in training, unemployed young women, including those from rural areas can earn money through online freelancing activities and even obtain full time digital jobs. After two KGGTF funded WOW pilot phases 85 women from five municipalities finished the program. Collectively their earnings totaled around $30,000 for 335 competitively gained online contracts, with five participants finding jobs in the local IT market earning over $9,000.

Based on the successful results of the donor led WOW pilots, Kosovo’s Ministry of Economic Development agreed to roll the program out across the country while also targeting young underemployed men. Preparations are in place under the International Development Association (IDA) funded pipeline Kosovo Digital Economy (KODE) project, which envisages the financing of digital connectivity, digital empowerment and work. It is expected that the new online work program under the KODE project will increase the employability of young men and women in the competitive online work market by teaching the types of jobs.

The WOW pilot program has been replicated by a number of organizations:

- The United States Agency for International Development (USAID) funded a private sector project called EMPOWER and a local solutions project called Advancing Kosovo Together.
- The Swiss Cooperation Office funded the Enhancing Youth Employment (EYE) project which was implemented by a consortium of Helvetas Swiss Intercooperation and Management Development Associates.
technical and soft skills that are in demand. By securing these skills, hundreds of young people will be able to engage for the first time in meaningful revenue generating activities to support themselves and their families.

Having learnt about the WOW program in Kosovo, the ICT ministries of neighboring Albania and Montenegro expressed interest in replicating the pilot. Further discussions in 2017 resulted in a high-level commitment to scale the program regionally under the digital integration pillar of the Multi-Annual Action Plan (MAP) for a regional economic area in the Western Balkans. Prime Ministers of six countries signed the MAP as part of the Berlin Process for the Western Balkan states, paving the way to a new women-focused online work intervention modeled after the WOW.
Unlocking Data Innovations for Smarter Urban Transport and Greener Growth

**PROGRAM GOAL**

To use open and big data best practices to prevent urban traffic congestion, reduce environmental damage, and improve lives.

Transportation data is increasingly available from multiple sources. Organizations such as transport operators, municipal systems, crowdsourcing, citizen reporting, in-road and in-vehicle sensors, and engineering data gathered from cell phone towers provide information that can be organized effectively to improve lives. This World Bank, KGGTF-funded green growth implementation program will leverage data available to prevent urban traffic congestion, reduce environmental damage, and improve mobility around cities. Initially, the program will develop a methodology for using open data sources, then make action-oriented recommendations. Piloted in several cities, the methodology will build on the World Bank’s Open Data Readiness Assessment tool. Such smart transport solutions can help ensure energy efficiency, aid green growth, and increase productivity and competitiveness, especially in urban environments.
Green Cities and Low Carbon Industries Initiative in Sub-Saharan Africa

PROGRAM GOAL

Improve efficiency in industrial processes in African cities, while enhancing climate and environmental resilience.

Cities and industries drive economic growth, but industrial cities consume vast quantities of energy and resources, and generate huge waste. This two-year program improves efficiency in industrial processes in African cities, while enhancing climate and environmental resilience. Using Korean Eco-Industrial practices and expertise, the money saved by increasing efficiency frees energy, natural, and fiscal resources for other areas of urban development. The program analyzes material flows, reviews and consolidates resource-use audits, and identifies ICT measures to improve efficiencies in target cities. The program will also sequence and coordinate public and private initiatives and investments on green measures for urban industries.
“Negawatt” Challenge for Energy Efficiency in Ghana and South Africa

PROGRAM GOAL
To pioneer an open innovation model for private sector engagement and investment in energy technology development and adaptation.

Africa’s rapid urbanization is deteriorating air quality, while African economies are losing an estimated 2.1% of GDP to power shortages every year. Mayors worldwide (C40 cities) are supporting innovative solutions to achieve negative energy, or “Negawatts” consumption. Following the successful 2013 World Bank-supported “hackathon” to improve access to clean drinking water and toilets, KGGTF’s three-year negawatt “hackathon” and “makeathon” initiatives engage stakeholders in South Africa and Ghana to identify innovative interventions for key problems areas. The initiatives challenge local, national, and global problem-solvers to create and collaborate on targeted, implementable solutions that combine indigenous knowledge with international expertise.

The program supports technology-enabled entrepreneurship, job creation, technology transfer, and energy efficient appliances and services. Going beyond related World Bank initiatives, the program is pioneering an open innovation model for private sector engagement and investment in energy technology development and adaptation. Korean technology transfer and private sector knowhow program is also promoting a robust start-up eco-system in emerging energy and technology sector communities. The program also aims to lower the cost of getting information on energy efficient technology options and services to consumers and service providers. After engaging stakeholders in Accra and Johannesburg—including the Ministries of Power and Energy, Private Sector Development, and the Investment Bureau and city authorities—the program will scale up in two additional cities.
ICT Applications to Achieve Green Growth in an Indian City

PROGRAM GOAL
To share knowledge for greening cities that will support optimizing energy use, reducing GHG emissions, and applying cost-saving innovations that will improve quality of life for the poorest people.

The integration of ICT across industries provides many opportunities for environmental benefits. KGGTF’s multi-year ICT applications to achieve green growth aims to share knowledge for greening cities to improve quality of life, reach the poorest people, while optimizing energy use, reducing GHG emissions, and helping cities apply cost-saving innovations. The program will assess cities to enable “smart” communities, explore the use of smart grid technologies, smart water management systems, and intelligent city planning. Korean technical experts will engage local city governments and stakeholders to develop green city initiatives.

Additional green ICT activities include implementing cloud computing, delivering services online, and enabling “e-waste management”. Other activities will introduce innovative wireless street lighting, programs to safely recycle ICT equipment, and solutions to address water scarcity. Lessons learned from the work will inform future projects in India and other countries.
Green Growth Hack-a-thon in Mongolia

**PROGRAM GOAL**

To engage the country's technical community through a “hack-a-thon” and identify innovative solutions to problems and challenges.

With two-thirds of the country living in urban areas, demand for services outpaces supply. KGGTF’s two-year USD $430,000 program supports the Government’s efforts to find green options. The program engages the country’s technical community through a “hack-a-thon” to identify innovative solutions to problems and challenges. The program will increase the use of digital technologies, open data, and on-demand information to improve public and private services and to save time and money. Self-reporting, real-time data and embedded sensors can enable an information infrastructure that alleviates congestion from increased traffic. The measures can save citizens time and reduce gas costs by an estimated USD $115 billion. Those methods can increase detailed understanding about the effects of transportation on city sustainability. Phase one will focus on the city of Ulaanbaatar, and phase two will turn to other urban areas across the country.
Enhancing Agricultural Green Growth in Vietnam by Applying Disruptive Technology to Facilitate Export of Quality, Safe and Climate Resilient Agricultural Products to Korea

**PROGRAM GOAL**

To support implementation of Vietnam’s green growth strategy in agriculture through opening high value markets for Vietnam’s climate resilient agricultural products.

Vietnam is highly exposed to the impacts of climate change, and its economy heavily relies on the agricultural sector (over 20% of national GDP, 65% of employment and 30% of exports). The Vietnamese agricultural sector also plays an increasingly important role as a global supplier, with 2018 exports reaching 185 countries and a total turnover of more than US$ 40 billion. Despite its crucial role, the agricultural sector in Vietnam has left an increasingly large and destructive environmental footprint over the last 25 years.

This activity aims at promoting the agricultural green growth strategy in Vietnam and creating and expanding markets for more profitable, climate resilient agricultural products, mostly through shifting from growing rice to growing tropical fruits. It will apply disruptive technologies (DT) to pilot a digital transaction platform and facilitate exports of high quality and environmentally friendly tropical fruits from Vietnam to Korea.

A key feature of this activity is the use of Blockchain and the Internet of Things (IoT) for the first time in Vietnam to improve traceability and value chain linkages in the selected fruit sub-sectors and support bilateral trade between Vietnam and Korea. This activity is aligned with World Bank operational objectives on inclusive green growth implementation.
Using ICT to Increase Green Competitiveness in Guatemala

**PROGRAM GOAL**
To stimulate small and medium sized enterprises (SMEs) to adopt clean production protocols and technologies, while improving competitiveness.

Supporting national programs to promote efficient industries, KGGTF’s two-year program is providing technical assistance to implement Guatemala’s energy policy. The program will stimulate SME’s to adopt clean production protocols and technologies, while improving SME competitiveness. Program activities include stimulating demand, improving supply, and linking SME’s through an ICT market exchange, open-source platform for service providers. The program will also support pilot implementation of energy management systems (EMS) in selected clusters. The smart systems will use sensing technology to enable real-time performance monitoring across production processes.
Smart-City Digital Approaches for Sustainable Urban Mobility in Latin-American Cities

**PROGRAM GOAL**
To promote resilient, greener, intelligent and sustainable urban mobility models in LAC cities.

Many cities in the developing world are embarking on transit reforms, of which Intelligent Transport Systems (ITS) are key elements. The impetus is driven by the need to address the negative externalities generated by the often low-regulated traditional bus system congestions, traffic-related accidents, GHG and local pollutant emissions. Many reforms are also driven by the notion that restructuring the supply chain, applying stricter quality control and more efficient regulations will ultimately result in meeting passenger needs in terms of improved accessibility, affordability and safety.

This activity will promote a resilient, greener, intelligent, and sustainable urban mobility model in LAC cities by developing a toolkit with three modules: (i) a manual to foster diagnosis of ITS systems; (ii) a manual to ease integral implementation of ITS systems, and (iii) an open source platform to support city-wide reform by integrating privately generated data into public planning and operating processes. This activity will be starting with LAC cities such as Mexico (CDMX), the largest and most populated metropolis in Latin America and the output would be reusable and replicable worldwide.

An international example of how to assimilate a conventional bus system into a city-wide integrated scheme, learned from comprehensive reform undertaken in Seoul, will serve as an important reference.
Nicaragua is one of many countries looking to deploy drones in geo-spatial land mapping. This cost-effective cadastre mapping that will result in a better understanding of the terrain and the ability to make better informed urban planning decisions.
Land Records and Geo-Spatial Information Systems Linked to Green Growth

**PROGRAM GOAL**

Support governments to develop accurate geo-spatial land mapping and data infrastructure that will provide accurate and timely information to guide smart and environmentally sound decision making around land and natural resource usage.

There is an urgent need for accurate and comprehensive databases that provide information on natural resources, deforestation, habitat, and land uses. Land records, tenure and zoning records are necessary for establishing accurate operations in areas such as: water quality, coastal zone management, and mapping desertification among other such issues to combat environment degradation and issues such as flood zones, and other substantial land issues. Access to such information can provide governments the ability to accurately assess each situation and establish plans and policies tailored to the needs of their country.

This KGGTF program will provide funding for Honduras, Nicaragua, Grenada, Saint Lucia, and Pakistan to receive knowledge and training on how to comprehensively support the mainstreaming of land records, information and geo-spatial systems. These countries will learn how to develop a cadaster-centric approach to surveying land and integrating data for effective E-Government. The geo-spatial and data infrastructure tools will enable improved planning, decision-making, policy implementation, monitoring and the development of a range of government web based services to support effective governance and city development.
Geospatial Information Management for Green Growth Operationalization

**PROGRAM GOAL**

To operationalize Green Growth (GG) through geospatial information management.

The World Bank’s Green Growth strategy aimed at promoting development includes a flexible approach to achieving progress across environmental, social, and economic pillars. The proposed activity will provide the knowledge and means of using geospatial information to achieve the WB’s green growth objective. Its main goal is to ensure that natural resources and assets can offer their full economic potential on a sustainable basis while also promoting activities that protect livelihoods and increase wellbeing.

Geospatial information can be used simultaneously for achieving the WB’s twin goals as well as developing action plans to combat unsustainable development, to improve data-driven decision making and to increase innovation and related growth opportunities.

By combining GG approach to the Integrated Geospatial Information Framework (IGIF) and World Bank Geospatial Information Management (GIM) toolkit with capacity building and Korea knowledge exchanges, task teams and clients will be able to develop and implement realistic Country-Level Action and Investment Plans for the National Spatial Data Infrastructure and GIM eco-system.

The Action Plans will identify country-specific needs to develop interoperable, fundamental data for enhancing GG approaches to socio-economic development for citizens. Leveraging the Korean experience provides good practice examples to influence GG-oriented GIM. The proposed activity will also complement the three ongoing Korean grants under the Global Land and Geospatial Unit.
Geospatial Approaches for Fostering Green Growth in Fragile States (FGGF) by Sharing the Innovative Experiences of Korea

**PROGRAM GOAL**

To provide technical assistance (TA) in support of Fragile and Post-Conflict countries, specifically in green initiatives and economic growth, with the help of geospatial infrastructure, data and analytics.

FCV countries still face major structural challenges that complicate the adaption of green growth strategies. In this context, the World Bank’s KGGTF supports TA that helps those countries develop geospatial data and analytics. These developments will introduce green-growth approaches and ultimately improve decision making, planning, policy implementation and monitoring.

This grant will also provide more cost-effective data options for policy, legal and operational work. KGGTF’s support will ensure that natural resources and assets can provide their full economic potential on a sustainable basis while protecting livelihoods and increasing beneficiary well-being.
Solar power prices are now competitive with electricity generation from existing fossil and nuclear power plants.
Energy demand is expected to increase by about 5% annually over the next three decades in Central America. This presents an opportunity for the region to boost its economy and increase global competitiveness.

However, reliability of the grid due to incorporating significant amounts of variable renewable energies for power generation, such as solar PV and wind, is a concern and countries in the region experience national blackouts due to sudden loss of power generation. Low diversified power generation matrices that are highly dependent on hydro and polluting thermal, mean that Central American countries are vulnerable both to the volatility of international oil prices and to climate change uncertainty, particularly the risk of prolonged droughts.

Additionally, the use of outdated structural equipment and static methodologies for the calculation of spinning reserves (reserve power generating capacity that is synchronized to the grid system) results in lack of control over the power system, inefficient use of resources and high electricity costs for both residential and industrial consumers.

GREEN GROWTH STRATEGIES
Countries in the region are looking for paths to support growth in a way that is clean and sustainable, helps mitigate the effects of climate change by reducing GHG emissions, and contributes to meeting renewable energy goals.

Part of the green growth solution to this environmental challenge is the smart integration of local power systems into a regionally connected power sector. Additionally, the progressive increase in the use of non-conventional renewable resources, such as solar and wind, which are not affected during drought seasons will help reducing the exposure to the effects of climate change.
Guatemala, Honduras, Nicaragua, El Salvador, Costa Rica and Panama make up the Central American region. These countries are working to incorporate variable renewable energies with new policies and technologies to support integration.
change increasing the regional power sector resilience. These generation sources require a more specialized system management due to their intermittent availability.

**KGGTF SUPPORTING SOLUTIONS**

As Latin American countries move to establish economically inclusive green growth throughout the region, Korea is emerging as a country that has successfully implemented many of the ideas, technologies and policies in the energy sector that are being explored.

To facilitate technical capacity building, the KGGTF funded a study tour for senior government officials from Central American countries to South Korea. This guided visit to energy agencies and operating sites such as the ESS Testbed and the Korea Power Exchange (KPX), enabled learning from experts with a track record of success implementing clean, sustainable energy technologies.

KGGTF also supported a renewable-energy grid-integration study to analyze the technical and regulatory viability of variable renewable energy integration into the national grid of each Central American country, and into a regional system.

Other foundational studies included a country-level energy-efficiency assessment to bring attention to aging, inefficient, polluting, and expensive infrastructure and the opportunities to improve the use and consumption of energy in the region. A feasibility study looked at improving energy
demand management in a variety of settings, from construction and industrial use, to water sector and residential use.

The first regional Energy Efficiency event of its kind in the region, America Central Eficiente, was held in Panama in November 2017 to bring stakeholders together to enhance regional dialogue and coordination.

**TRUST FUND IMPACT**

By supporting the governments of Central American countries to develop electricity consumption forecasting systems, savings in energy reserves could reach 50% as compared to that used under previous control systems. This will help benefit consumers through cost reduction, mitigate environmental damage by lowering GHG emissions, and leverage the region’s resources efficiently to support economic growth.

This green growth approach combining global knowledge, financial and technical assistance is supporting governments of Central American countries to provide nationwide access to clean, stable renewable energy, an essential component for sustained economic growth. The program’s outcomes will inform the preparation of new World Bank lending operations under discussion with the governments of Nicaragua, Panama El Salvador, and Honduras; and the World Bank has received official requests from the Governments of El Salvador and Nicaragua to replicate the support provided on Energy Efficiency in Panama.

**KEY STAKEHOLDERS & PARTNERSHIPS**

To facilitate the integration of these energies in the Central American region, World Bank Group teams worked with the Governments of Panama, Honduras, Guatemala, Costa Rica, El Salvador & Nicaragua.

This World Bank Group intervention to increase technical capacity in the region was supported and enabled by the KGGTF in partnership with:

Energy Sector Management Assistance Program (ESMAP)

Spanish Fund for Latin America and the Caribbean (SFLAC)
Cleaner Production for Companies in Egypt

**PROGRAM GOAL**

To help Pakistan continue its natural resource efficiency efforts and associated cost savings.

Industry in Pakistan is competing more and more with the country’s agricultural and power sectors for limited water and energy resources. The country already faces a 5-gigawatt shortage and severe load shedding and blackout problems, causing factory closures and unemployment. This World Bank KGGTF funded green growth implementation program will support Pakistan continue its natural resource efficiency efforts and their associated cost savings. The next phase will target, investigate, and plan for cleaner production technologies for textiles, sugar, pulp and paper, and leather. If resource efficient technologies can be implemented, manufacturers can become more resilient and better protect themselves and their employees from closures, in addition to preparing for resource shifts expected with climate change.
Capacity Building and Technical Learning Workshops on Energy Storage to Accelerate Energy Transition

**PROGRAM GOAL**

To identify key challenges for the scaling-up of renewable energy and to determine the role of energy storage in facilitating the decarbonization of the power sector.

The proposed activity consists of the organization of a series of regional capacity building and technical learning workshops on battery storage, aimed at enhancing the technical capability of client countries on strategy, regulation, and implementation of battery storage project development.

The activity would be focused on two main components: i) regional energy storage workshops ii) knowledge exchange activities to focus on lessons learnt from operational experiences. Multiple topics like battery storage technology fundamentals, institutional set-up and policy, as well as financing mechanisms and regulatory frameworks will be covered. The workshops will invite international experts as speakers, including Korean industry leaders.

The workshops will provide opportunities for participants to closely interact to identify business opportunities. Representatives from World Bank partner countries, as well as stakeholders from different regions will be invited to gain insight on the application of storage technologies for their power system operations and renewable energy integration.

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In Vietnam three separate test pilots are underway to demonstrate how roof-top solar panels could meet much of the country’s energy needs.
Long-term Resilience: Investing in Hydropower Green Growth Under Uncertainty

**PROGRAM GOAL**

To pilot Resilience Guidelines for the Hydropower sector developed with KGGTF funding in order to test and ensure their practical and effective use.

Historical data is no longer sufficient for planning due to uncertainties in rapid socio-economic changes. To solve this problem, the World Bank KGGTF funded the creation of Guidelines to develop new approaches in long-term planning to improve the resilience of investments through tools and solutions for robust risk management and decision-making. The application of these Guidelines will help to identify vulnerabilities to climate and other uncertainties under the WBG green growth agenda.

By providing support for the implementation of the Guidelines developed with funding from the KGGTF, this grant will help design more robust and resilient investments and ensure that the Guidelines are practical for users. The application of the Guidelines will be demand driven and fed directly into operations or technical assistance to identify specific future investments. The goal is to put decision makers in a better position to take relevant long-term decisions for the hydropower sector, and to understand how to incorporate resilience into their planning in a meaningful way.

KGGTF support will enable both training in climate change resilience for selected client countries and dissemination of the Guidelines at the World Hydropower Congress in Paris in May 2019. This grant will support the use of these Guidelines for World Bank funded projects across all regions. It will help mainstream long-term green growth in project design and hydropower system planning, ensuring that Hydropower investments are more robust to whatever future conditions may materialize.
Energy Storage Systems and Grid Stability in West Africa

PROGRAM GOAL
Support the West Africa Power Pool (WAPP) countries to increase reliance on renewable energy sources, and critically, battery-operated energy storage systems (ESS). Increased sources will stabilize prices and build long-term, integrated energy infrastructure in West Africa, while supporting ECOWAS to meet its renewable energy goal of 48% by 2030.

This Korean Green Growth Trust Fund (KGGTF) grant supports WAPP countries as they refine policy frameworks and infrastructure planning and upgrades for increased reliance on renewable sources of energy, including large-scale hydroelectric, wind, and solar. Funding will support WAPP to assess energy storage system applications and financing in member countries and then train existing utility managers to plan for and employ ESS for grid support, grid integration, and green growth.

ESS store excess energy (e.g., from solar PV panels on bright days), detect dips in supply, and supplement grid activity with stored energy. The grant will fund a study exchange for utilities operators in West African to see first-hand how ESS are successfully being used in other countries to reduce energy dips and support grid stability and integration.

The program builds on related World Bank programs focused on reinforcing the power grid and pooling resources in West Africa to provide reliable, affordable electricity in the region.
Strengthening Utility Capabilities through Capacity-Building, Education and South-South Knowledge Exchange

PROGRAM GOAL
Build technical and management capacity in Sub-Saharan Africa, with an emphasis on maximizing the utilization of existing assets, repairing existing networks, and growing new networks in a way that is green, resilient and inclusive.

The Sub-Saharan African region has some of highest wind and solar potential in the world, and, combined with geothermal in the east, and hydropower in the west, is capable of providing much of its power through green sources. However, capacity limitations at grid level currently means that most power is provided through thermal plants rather than renewable sources.

This KGGTF program seeks to significantly boost capacity in both planning and operations in order to promote inclusive and resilient green growth. A key component of the program will be a partnership with the Korea Electric Power Company (KEPCO), a unique institution with significant operations, training and R&D departments. Through workshops, twinning arrangements between utilities and KEPCO, and instruction on operational best-practice from KEPCO employees and professors at the Korea University of Science and Technology School of Engineering, the program will broaden the skillsets of utility staff who currently have backgrounds in electrical or civil engineering into utility professionals, are capable of thinking grid-wide, and are able to improve grid resilience, reduce emissions and increase green growth through universal access to power.
PROGRAM GOAL
Support the Government of Ethiopia's green industrialization agenda by providing the analysis and information to enable prioritization, targeted interventions and policy implementation.

Climate change and green growth are top priorities for Ethiopia. The Government of Ethiopia (GoE)'s vision is to turn Ethiopia into a Middle Income Country by 2025 and to establish the country as a light manufacturing hub in Africa over the next 10 years.

This KGGTF program will complement and inform existing World Bank programs on industrialization by assisting Ethiopia to pursue sustainable industrialization, with the objective of energy and resource savings as well as environmental pollution abatement.

The grant will fund four integrated activities beginning with a green competitiveness analysis of key industries, based on which a tailored set of green competitiveness evaluation analysis indicators will be developed. The performance of these industries will then be benchmarked against regional competitors for green competitiveness. A review of the current industrial park framework will identify gaps and opportunities to scale green industrialization. Based on this analysis a green industrialization strategy will be developed to support the GoE’s Climate Resilience and Growth Strategy for Ethiopia’s main competitive sectors.
Smart Technology and Energy Efficient Production in Egypt

**PROGRAM GOAL**
Increase the use of and investment in clean technologies in Egypt.

A growing population and rising fuel demand, coupled with a finite supply of fuel, creates a security risk for Egypt. In 2013, Egypt became a net energy importer—a situation that poses serious challenges to industrial and economic growth. Currently, high energy subsidies discourage energy-efficient practices.

This World Bank KGGTF funded green growth implementation program aims to encourage growth in clean technology manufacturing and services. New regulatory tools need to drive investment in new systems. These clean technologies, will be identified through a market gap analysis and minimize fuel use and greenhouse gas emissions, will be leveraged to create cost savings and increased competitiveness in a new green economy.
Energy Efficiency Transformation of Urban Heating in Chisinau, Moldova

**PROGRAM GOAL**

Reduce dependency on gas imports with the use of district heating.

Urban heating systems in the Moldova’s capitol, Chisinau, are woefully outdated, resulting in significant energy loss. This World Bank KGGTF funded green growth implementation program supports transforming these systems from supply-driven setups to an efficient consumer demand based model using district heating. Grant money will support development of a pilot program and the financial planning and analysis for individual heat substations. This will eventually allow for customized monitoring and heating of individual buildings, and a billing system that rewards energy-savings. District heating in Chisinau has the potential to reduce gas consumption by 20%, as well as tap renewable resources such as biofuel. Such changes will improve the resiliency of urban infrastructure, and pave the way for other regions that strive to couple economic growth with energy efficiency and environmental sustainability.
Support the Development of a National Industrial Energy Management Program in Uzbekistan

**PROGRAM GOAL**

To increase the energy efficiency and competitiveness of industrial infrastructure.

Uzbekistan has the largest population among central Asian countries and remains one of the most energy intensive countries in the world. As its economy continues to grow, Uzbekistan desires policy changes to increase energy efficiency measures in the industrial sector—an area that has the greatest short to medium term energy savings potential.

This World Bank KGGTF funded green growth implementation program will develop institutional capacity and support policy reforms, as well as demonstrate innovative and scalable financing and delivery mechanisms for industrial energy efficiency in Uzbekistan. Initial tasks include introducing a framework for mandatory or voluntary energy savings agreements, developing performance benchmarking requirements, and designing implementation plans. The government will start a pilot industrial energy-management system and foster knowledge exchange, in particular with Korea and China.

_Uzbekistan_ is looking to Korea to gain knowledge about establishing energy management systems to increase energy efficiency in the industrial sector.
Greener Manufacturing in Turkey

**PROGRAM GOAL**

To bring a broader cross-sector level consensus around greener manufacturing in Turkey.

The World Bank, jointly with the Turkish Ministry of Science, Industry and Technology (MoSIT), is undertaking a project to improve the government’s response to greener manufacturing through improved energy management, renewable energy interventions and resource conservation throughout the industrial sectors. This ongoing technical advisory project will develop a comprehensive roadmap to scale up greener manufacturing in Organized Industrial Zones (OIZs) of Turkey. As part of this effort, the project is working with the Korea Energy Agency on promoting energy management and clean energy throughout the industrial sector.

This KGGTF funded program will support that initiative by way of a technical and financial diagnostic study to identify the most opportune actions to be taken to scale up sector level energy efficiency, resource efficiency, captive power opportunities and to formulize them for adopting an energy management system in a structured fashion. Based on the technical opportunities, the program will evaluate the regulatory framework to maximize the support for energy management system (EMS) development and growth and suggest actions required for the uptake of greener manufacturing. This analysis will then be consolidated together with the outcomes of the financial and regulatory diagnostics to establish a roadmap for greener manufacturing development in Turkey.

The end results of this program is to reduce greenhouse gas (GHG) emissions, save energy from manufacturing operations, make inroads to firm and sector level EMS certification and contribute to Turkey’s commitments to climate action.
Scaling Up Rooftop Solar PV in Turkey

**PROGRAM GOAL**

To support the development of Turkey’s rooftop solar PV (RSPV) market, including informing preparation of a new World Bank lending operation in support of the RSPV market.

The solar boom in Turkey (from 40 MW in 2014 to almost 3,500 MW at the end of 2017) to date has been primarily limited to ground-based projects under 1 MW in size in order to take advantage of the unlicensed feed-in-tariff (FiT) schemes. As of the end of 2017, only 200 MW of RSPV had been installed in Turkey, mainly in large industrial and commercial. In contrast, fully developed solar markets such as Germany, the US and Japan produce a significant portion of solar capacity through RSPV applications with 1KW and 10MW capacities.

The RSPV market potential in Turkey for the next ten years has been estimated at 4 GW, taking grid capacity constraints, projected growth in RSPV sales, affordability and creditworthiness into consideration.

This World Bank KGGTF grant will help address some of the barriers for RSPV scale-up in Turkey, which were identified in a market assessment carried out by the World Bank in 2017. The grant will support the development of technical standards and quality assurance systems for RSPV installations, design financial schemes and Government support options for various markets segments and define viable business models adapted to the applicable regulatory framework.

The activities under this program are expected to inform a potential new World Bank lending operation in support of the RSPV market. The World Bank team will ensure that knowledge exchange events, capacity building activities and engagement with institutions and companies from the Korean energy sector are undertaken.
Green Growth in India through use of ICT and Investment in Clean Energy Generation

**PROGRAM GOAL**

To promote investment in floating solar and energy storage solutions (ESS) in India.

Use of ICT and investment in clean energy generation represents a green growth opportunity for India, which must start with a clear and comprehensive understanding of the market in the Indian context.

This KGGTF program will include a workshop on floating solar intended to sensitize the market including government, public sector companies, private investors and developers, amongst other stakeholders. Following this a study will be conducted to identify the potential suitable sites for floating solar projects in two states of India.

In relation to energy storage solutions (ESS) activities supported by the program will include a market assessment of ESS in the Indian context, mapping of Indian states to determine their readiness to invest in ESS, identification of more progressive states to help select pilot projects within those states, and pre-feasibility studies for the pilot projects.
Implementing a Smart Grid into the Bangladesh Power System

**PROGRAM GOAL**

To increase energy resilience and economic development in Bangladesh by implementing a smart grid that facilitates renewable energy integration.

Smart grids are more than just a way to improve energy efficiency and resilience—they can also be powerful green growth tools for addressing economic, environmental, and social inequities.

This World Bank KGGTF funded green growth implementation program will investigate and plan smart grid solutions for reducing Bangladesh’s dependence on expensive oil and dwindling gas supplies, making electricity cheaper and more accessible, and improving energy reliability. The program will identify ways to create and integrate solar and hybrid mini grids into larger scale energy generation and transmission plans. Relying on the expertise of Korea Power Exchange, Bangladeshi officials will plan for the automated dispatch of energy, the introduction of smart grid technologies, and more renewable sources, reducing operational and system failures and boosting energy access. The end result: a fuel economy that is less polluting, more secure, the generator of successful solar powered irrigation in rural areas, and the catalyst for empowering the nearly 40% of the population that currently lives without electricity.
Renewable Energy Integration in Sri Lanka

**PROGRAM GOAL**

Support the government as it establishes and implements policies for renewable energy development, energy efficiency, and energy conservation.

Economic growth in Sri Lanka has come with an increased demand for energy, which means the country, with limited domestic sources of conventional energy sources, has recently spent US$5 billion annually on fossil fuel imports. This imported coal, fuel oil, and petroleum, among other fossil fuel sources, accounts for an alarming 40% of Sri Lanka’s energy and makes the country vulnerable to volatility in fuel supplies and prices, and makes it hard for the government to meet its commitment to reduce greenhouse gas emissions.

This KGGTF program will help Sri Lanka meet its goal of achieving energy independence by 2050 and fulfill a mandate the government set to develop and implement policies for renewable energy development, energy efficiency, and energy conservation. In the shorter term, it will help the country meet its goal to use 20% renewable energy by 2020, increasing renewable energy use to 1,000 MW from 442 MW.

More specifically, KGGTF funding will help Sri Lanka and the Ceylon Electricity Board, which owns and operates 65% of the total installed energy capacity in the country, via technical, economic, and regulatory analysis on renewable energy demand-side efficiency, demand-side management, and storage. Knowledge exchange focused on system control and forecasting, grid stability, smart grid solutions, and renewable energy integration; and the preparation of a private-public partnership purchase agreement for wind generation.

This important work will help further World Bank lending operations in Sri Lanka to finance climate resilient capacity building, including a US$172 million program with the Sri Lanka Wind Development Program and a related variable renewable energy grid integration project that will help the country turn around its energy mix and create inclusive, sustainable green growth economy.
Scaling Up Non-Conventional Renewable Energy in Sri Lanka

PROGRAM GOAL
Support the Government of Sri Lanka to reach their target goals of achieving 20% energy from non-conventional renewable sources in the country’s electricity mix by 2020, and becoming energy self-sufficient by 2050.

Sri Lanka spends 50% of its export income on fossil fuel imports, which has resulted in economic vulnerability as the country is exposed to volatile energy prices. While there is enormous potential for renewable energy in Sri Lanka there are technical issues around grid stability and backup capacity that need to be addressed. Policies and the regulatory framework need to be created to support successful multi-stakeholder engagement and promote investment. Capacity building must also be established.

Key components of the program will include an assessment that demonstrates the technical and economic viability of deploying variable renewable technologies (also called NCRE) and Liquefied Natural Gas, along with a technical diagnosis and study of grid integration. Establishing wide stakeholder engagement and building institutional capacity across technical, economical and policy arenas will also be critical to effectively implement the transition. This grant continues to build on previous programs, all of which aim to translate the Government’s vision and targets into implementation-ready plans and projects.
Renewable Energy Integration to Support Green Growth in Pakistan

PROGRAM GOAL
Provide technical assistance and capacity building to support the Government of Pakistan as it works to attain sustainable development of large-scale and distributed solar PV.

Energy demand in Pakistan is increasing rapidly. To meet these demands, the country is focusing significant investment in the power sector, including construction of coal-based power plants, funded through bilateral agreements with China. Pakistan has considerable potential for renewable energy resources.

Recently, the Government requested support from the World Bank to develop operations that would address barriers and mobilize investments in solar. This KGGTF grant will support the Government to explore the feasibility of developing two utility-scale solar PV plants, one to demonstrate conjunctive use with hydropower, and the other to demonstrate conjunctive use with wind. Both wind and hydro are proven available resources in Pakistan as there is significant available land for future large-scale investment.

The grant will additionally support both the preparation of a rooftop PV pilot program, and the preparation of an off-grid renewable energy-based rural electrification program. Technical assistance and capacity building activities will build the critical skills that policy practitioners and utility engineers require to engage relevant stakeholders to implement plans effectively. Ultimately, the program aims to support the Government with a clear strategy for renewable energy investment, a knowledgeable team, and the policies to facilitate the development of sustainable energy solutions.
Energizing Green Cities: Planning, Enabling and Managing the Transition to a Low-Carbon Future in Vietnam and Indonesia

**PROGRAM GOAL**

*Increase energy efficiency and job opportunities and decrease greenhouse gas emissions in Vietnam and Indonesia.*

Choosing energy efficient solutions for urban infrastructure challenges can help cities become global engines of green growth. This World Bank KGGTF funded green growth implementation program aims to incorporate energy efficiency and emissions targets in green business strategies in Da Nang and Surabaya. The proposed program will identify possible public and private sector investors, attempt to reform national and local financing policies and incentives, monitor and evaluate pilot programs, share lessons learned from Korea, and organize capacity building workshops on how to scale-up sustainable urban growth. The goal is to support cities develop their own plans for low-carbon futures that strengthen governance and economic growth, and improve quality of life and environmental protection.
Rooftop Solar in Vietnam

**CONTEXT**

Vietnam has witnessed impressive economic growth and poverty reduction in the past 25 years. The development of the energy sector has been a key factor in its recent industrialization process, creating jobs and increasing prosperity. However, partly due to a huge increase in electricity demand, greenhouse gas emissions have more than doubled over the past decade. Climate change represents a significant threat to Vietnam as it is particularly vulnerable to extreme weather events.

**GREEN GROWTH STRATEGIES**

To address the impact of climate change and continue the economic growth trajectory in a sustainable way, the country has ambitious targets for the development of renewable energy electricity generation in the country, with a target for 12 GW of installed solar PV capacity by 2030. The country has requested the support of the World Bank for several solar PV activities including: the creation of a comprehensive solar strategy, identifying appropriate financial incentives to support the implementation of the project, and the development of in-country capacity building to maintain solar energy generation over the long-term and create jobs.
KGGTF SUPPORTING SOLUTIONS
These grants support Vietnam to assess the process of grid integration, review regulatory requirements, and create the necessary framework for private-public partnerships. Additionally, the KGGTF is providing technical assistance to assess the total solar PV capacity that could be installed across public and private buildings in two of Vietnam’s largest urban areas—Da Nang and Ho Chi Minh City.

Building on the knowledge gained, the next phase identifies and assesses city level impacts of a rooftop solar PV program, including technical challenges and the potential use of battery storage and advanced ICT solutions.

Funding will be used to develop and propose a sustainable business model for rooftop solar PV scale-up for the two distribution companies Ho Chi Minh Power Corporation (HCMPC) and Central Power Corporation (CPC), and to further explore options for financing and rooftop program implementation.

TRUST FUND IMPACT
In addition to the installation of solar as a key source of electricity, the successful policy, technical and financial elements of these two grants will be replicated in other cities in Vietnam and across the region.
Improving Readiness for Energy Efficiency Investment in Vietnam’s Industries

PROGRAM GOAL
To support and build on the momentum created for industrial energy efficiency (EE) in Vietnam. To improve readiness for EE investment in Vietnam’s industries by demonstrating the viability of various industrial EE technologies and business models, and facilitating stakeholder engagement and knowledge sharing.

Vietnam has experienced impressive economic growth and poverty reduction in the past 25 years. It has also proved to be one of the most energy intensive countries in East Asia with the country's emissions expected to increase dramatically by 2030. To meet future energy demands, the country must focus on improving EE and defining it as the single lowest cost option to develop energy security. Achieving this will require durable programs and policies that focus on efficient energy technology.

This KGGTF grant supports the demonstration and viability of industrial EE technologies and business models. This grant will further support the development of selected industrial EE projects and pilot suitable business models to attract the participation of industrial enterprises (IEs) and participating financial institutions (PFIs). This activity is expected to increase the efficiency of the EE sector in Vietnam through a cost-effective scale of EE by promoting a coordinated pipeline development mechanism, and technologies and business models applicable to Vietnam’s circumstances and market participation.

Through the activities under this program, Vietnam will promote industrial EE to reduce its long-term dependence on imported fuels and exposure to volatile world market prices, therefore strengthening the country’s energy resilience.
Regional E-mobility and Battery Storage Programmatic Technical Assistance (TA) for Pacific Island Countries and Territories

**PROGRAM GOAL**

To support the design of a regional Electric Vehicle (EV) and Energy Storage System (ESS) deployment roadmap in Pacific Power Association (PPA).

The Pacific Island Countries (PICs) comprise of 10 states with a total population around 2.3 million. This population is scattered over an area equivalent to 15 percent of the globe’s surface. The PICs have open, but narrowly based economies and limited institutional capacity.

The major issues that PICs face in relation to the power sector include high dependency on costly imported fuels (expenditures account for 10 to 25% of GDP), a lack of adequate capacity and reliable data for energy planning and management as well as a lack of sources to finance battery storage and other facilities that can properly absorb renewable energy in isolated island territories.

This activity will focus on cooperation with the the Pacific Power Association (PPA), the key regional organization that provides support to power utilities in PICs and supports PPA’s efforts aimed at delivering a long-term strategy that will address the energy sector challenges. This will include the deployment of EVs and ESS. The PPA, as a focal point of the proposed activity, also intends to initiate a programmatic regional approach to scale up EVs and ESS with the World Bank.

The activity will include a component on institutional capacity to ensure not only proper implementation of e-mobility, but also general battery storage management. This project will also promote increased resilience, focusing on making cities and transport systems more robust, while facing risks arising from past development mistakes and a changing climate. The Korean experience and strong example of EV and ESS deployment on islands (for example Jeju, the biggest island in Korea), will also be considered.
Variable Renewable Energy Integration to Support Green Growth in Haiti

**PROGRAM GOAL**

To boost green economic growth in Haiti by supporting the government’s efforts to reach 25% renewable energy use by 2020.

Access to electricity in Haiti is estimated at 30% overall and at only 5 percent in rural areas, leaving more than 7 million Haitians without basic services and the competitive edge that allows for economic development opportunities. By evaluating the viability of tapping into regional hydroelectric, wind, and solar potential in Haiti, this World Bank KGGTF funded green growth implementation program aims to support the Haitian government as it synchs up efforts to expanded energy access and reach its goal of using 25% renewable energy by 2020. An economic analysis will gauge the possibility of integrating more low carbon renewables into Haiti’s somewhat unreliable main power system, and explore the technical and financial feasibility of connecting with the Dominican Republican grid in an effort to provide more efficient, clean, and reliable electricity, allowing Haiti to leverage green growth and climate change mitigation strategies for economic development. The economic study will also address the potential green growth impacts of renewable energy on job creation, markets, innovation, and development countrywide.
Greening Energy Systems in Peru

**PROGRAM GOAL**
Support the Government of Peru to increase hydroelectric energy use, replace fossil fuel supply with natural gas, improve energy efficiency, and make energy systems more resilient in the face of extreme weather and climate change.

This Korea Green Growth Trust Fund program will assess the integration of more hydropower and natural gas in the energy matrix, identify innovative financing mechanisms for upgrading transmission and distribution systems, and develop an action plan for increasing energy efficiency. Core components of the program will also help grow a green economy and expand the job market in Peru. The Government of Peru intends to resurrect hydropower, which saw a 49% decrease from 2000 to 2014, in part because of lower natural gas prices. It recognizes the need to make its energy systems more resilient in the face of more extreme weather and climate change.

*Peru* is interested in increasing its use of hydroelectric energy. This would help to diversify the country’s energy mix and move towards a more resilient energy sector.
AGRICULTURE

EUROPE AND CENTRAL ASIA

2 PROGRAMS
Support to the Preparation of the Sustainable Livestock Development Project in Kazakhstan

**PROGRAM GOAL**
To mainstream Green Growth (GG) in the proposed Program for Result (P4R) operation for Sustainable Livestock Development Project in Kazakhstan.

Development of an export-oriented meat sector would help Kazakhstan diversify its exports away from oil, better use its other natural resource (pasture and grassland) and promote rural growth. Meanwhile, since Kazakhstan has limited experience with the export-oriented meat sector, substantial international competition can create significant obstacles in its efforts aimed at sustainable livestock development. Moreover, livestock production is associated with a significant carbon and environmental footprint.

While Kazakhstan has declared Green Economy principles as a core of its development pathway through 2050, its government has little experience in policies and principles of GG, especially in the agri-food sector.

With KGGTF funding this initiative will help to design the P4R by contributing to technical assessment, which in turn will support policy actions necessary for mainstreaming Green Growth in Government Livestock Program.

This project will also support job creation and contribute to improved incomes in rural areas by incentivizing green investments for productivity gains, increasing technology transfer, and improving food quality and safety.
Leveraging Technology for Uzbekistan’s Agricultural Modernization

PROGRAM GOAL
To pilot smart farming techniques for soil tests and fertility management and promote climate-smart agriculture for horticulture farmers under the proposed Agriculture Modernization and Competitiveness Project (AMCP).

Uzbekistan’s agriculture strategy recognizes that restoring agricultural growth, which has dropped sharply in recent years, will require the delivery of a wide range of quality agricultural public services. They include applied agricultural research and development, advisory services, education, soil fertility improvement, environment protection, and climate change adaptation. Global experience shows that these public services are key to correct market failures and eventually accelerate agricultural transformation and shift this sector to a greener development path.

However, Uzbekistan is significantly exposed to climate hazards, and the adaptation capacity of the country’s agriculture has been assessed as weak. The Agriculture Modernization and Competitiveness Project (AMCP) aims at strengthening the delivery of selected agricultural services in Uzbekistan for supporting development of the export-oriented horticulture. This KGGTF funded program seeks to promote the practical application of innovations that can be demonstrated and scaled up within the context of the AMCP. The sharing of practical knowledge can be applied along with national programs to inform public expenditures, saving public funds by investing in modern equipment. KGGTF activities will also lead to improved competitiveness within the Uzbek agriculture sector.
## ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>AFR</td>
<td>Africa</td>
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<tr>
<td>BRT</td>
<td>Bus rapid transit</td>
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<td>CDD</td>
<td>Community driven development</td>
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<td>CO2</td>
<td>Carbon dioxide</td>
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<td>CoP</td>
<td>Communities of practice</td>
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<td>CPS</td>
<td>Country partnership strategy</td>
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<td>DPL</td>
<td>Development policy loan</td>
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<td>DRM</td>
<td>Disaster risk management</td>
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<td>EAP</td>
<td>East Asia and Pacific</td>
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<td>ECA</td>
<td>Europe and Central Asia</td>
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<td>EE</td>
<td>Energy efficiency</td>
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<td>EIP</td>
<td>Eco industrial park</td>
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<td>EMS</td>
<td>Energy management systems</td>
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<td>EV</td>
<td>Electric vehicle</td>
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<td>GDP</td>
<td>Gross domestic product</td>
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<td>GG</td>
<td>Green growth</td>
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<td>GHG</td>
<td>Green house gas</td>
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<td>GIS</td>
<td>Geographic information system</td>
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<td>ICT</td>
<td>Information and communications technology</td>
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<td>IFC</td>
<td>International Finance Corporation</td>
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<td>ITS</td>
<td>Intelligent Transport System</td>
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<td>IWRM</td>
<td>Integrated water resource management</td>
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<td>KE</td>
<td>Knowledge exchange</td>
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<td>KL</td>
<td>Knowledge and learning</td>
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<td>KGGTF</td>
<td>Korea Green Growth Trust Fund</td>
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<td>LAC</td>
<td>Latin America and Caribbean</td>
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<td>LCC</td>
<td>Low-carbon cities</td>
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<td>LEDS</td>
<td>Low emission development strategies</td>
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<td>MNA</td>
<td>Middle East and North Africa</td>
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<td>MW</td>
<td>Megawatt</td>
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<td>NMT</td>
<td>Non Motorized Transport</td>
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<td>ODA</td>
<td>Official development assistance</td>
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<td>PPP</td>
<td>Public Private Partnership</td>
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<td>RR</td>
<td>Rapid response</td>
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<td>RDM</td>
<td>Robust decision-making</td>
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<td>RoK</td>
<td>Republic of Korea</td>
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<tr>
<td>SDN</td>
<td>Sustainable development network</td>
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<td>SME</td>
<td>Small and medium-sized enterprises</td>
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<td>SV</td>
<td>Study visit</td>
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<td>SWM</td>
<td>Solid waste management</td>
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<td>TA</td>
<td>Technical assistance</td>
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<td>TOD</td>
<td>Transit oriented development</td>
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<td>TTL</td>
<td>Task team leader</td>
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<td>UNDP</td>
<td>United Nations Development Programme</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<td>VRE</td>
<td>Variable renewable energy</td>
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<td>WBG</td>
<td>World Bank Group</td>
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KGGTF is committed to sharing technical knowledge and first-hand experience of implementing integrated green growth solutions that contribute to sustainable development and shared economic prosperity.

To learn more about us visit www.wbgkggtf.org and for enquiries about grant applications please contact the Country Management Unit at your local World Bank office www.worldbank.org.