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# 2013
# ANNUAL REPORT

ESMAP
Energy Sector Management Assistance Program

## MISSION

The Energy Sector Management Assistance Program (ESMAP) is a global knowledge and technical assistance program administered by the World Bank. It provides analytical and advisory services to low- and middle-income countries to increase their know-how and institutional capacity to achieve environmentally sustainable energy solutions for poverty reduction and economic growth. ESMAP is funded by Australia, Austria, Denmark, Finland, France, Germany, Iceland, Japan, Lithuania, Norway, Sweden, the Netherlands, and the United Kingdom, as well as the World Bank.

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CHAPTER 1

# COMPLEX CHALLENGES, DYNAMIC OPPORTUNITIES

The year 2013 marks 30 years since ESMAP, the Energy Sector Management Assistance Program, was founded. The program was originally set up as a small team within the World Bank to advise non-oil producing developing countries in the wake of the oil price shocks of the 1970s (see Box 1.4). That original vision has since been transcended. ESMAP has grown and matured over the years, responding to the evolving needs of its low- and middle-income client countries, and the increasing complexity of the global energy sector.

ESMAP is now one of the longest standing trust-funded programs within the World Bank Group (WBG), and a key element of the WBG's energy operations. At any given time, ESMAP supports a portfolio of nearly 100 ongoing activities that provide advisory services and technical assistance to clients and produce cutting-edge global knowledge products that can be used to address the energy challenges of developing countries. This work in turn informs the WBG's country policy dialogue and lending operations; ESMAP's current portfolio of activities has become a leading indicator of the World Bank's future energy portfolio.

ESMAP has stayed true to its mandate by targeting its resources and activities directly at the needs of clients. Those needs may have changed since the 1980s, but they are if anything as urgent, and in many cases a great deal more complex. Energy security remains a pressing concern; countries are looking to boost energy efficiency and local sources of supply—many of them renewable—to reduce the burden of importing expensive fossil fuels. There are major gains to be made by increasing cross-border energy trade in a number of regions, but in many cases technical, financial, and political barriers stand in the way. Rapid urbanization creates heavy demand for energy services, and existing delivery systems often cannot keep up. Energy poverty threatens the achievement of a number of the Millennium Development Goals. National grids must be upgraded to integrate new sources of supply and feed new industries and population centers. And planners must take into account emerging challenges, such as the vulnerability of energy systems to climate change and natural disasters.

Globally, ESMAP also plays a major role as the WBG increases its support to the Sustainable Energy for All (SE4ALL) initiative. Launched by UN Secretary General Ban Ki-moon in late 2011, SE4ALL brings together a coalition of international organizations, national governments, major private sector enterprises and civil society to support the achievement of three overarching goals by 2030: (1) universal access to modern energy services; (2) doubling the rate of improvement in energy efficiency; and (3) doubling the share of renewable energy in the global energy mix.

ESMAP is delivering on a number of the commitments made by the World Bank in support of SE4ALL at the UN's Rio + 20 Summit in June 2012[1]. In FY2013, ESMAP launched the Global Geothermal Development Plan (GGDP, see Chapter 2), a major new initiative on renewable energy resource mapping, and a technical assistance program to help countries achieve SE4ALL's ambitious goal of universal access (see Chapter 3). ESMAP was also a co-author of the *Global Tracking Framework* report, which sets the global baseline for the SE4ALL goals (see Box 1.3).

As the *Global Tracking Framework* report makes clear, there is a great deal of work to be done if those goals are to be met. About 1.2 billion people around the world still lack access to electricity, and 2.8 billion lack access to modern household fuels. Household air pollution caused by cooking with traditional fuels contributes to about four million premature deaths a year, most of them women and children. Renewable energy accounts for only 18 percent of the global energy mix, with most of that coming from traditional biomass fuels such as charcoal and firewood. While the world has made steady progress in the past two decades, that improvement will have to speed up, and hundreds of billions of dollars in new financing will have to be mobilized, to achieve the three SE4ALL goals by 2030.

Energy sector development is becoming more central to the political economy of countries, with implications beyond energy generation, transmission and distribution, policies and infrastructure. Energy subsidies impose a fiscal strain on governments; lack of reliable and affordable power undermines opportunities for economic growth, trade competitiveness, and employment

[1] See ESMAP 2012 Annual Report.

triggering social instability; lack of access to clean cooking solutions impose a significant disease burden on women and children.

It is increasingly necessary to develop more inclusive and transparent—and often bottom-up—approaches to energy governance and the delivery of concrete energy solutions. The roles of civil society, the private sector and local government are becoming more important, as is the role of ministries of finance, planning and economic development. ESMAP's support to client countries reflects this new reality: the number of stakeholders in ESMAP's activities now goes beyond traditional line ministries and technical experts.

ESMAP currently supports a wide variety of activities that involve working with sub-national governments, civil society organizations, and local communities. These activities often also include a strong donor coordination component. Examples include:

- In **Vietnam**, low carbon development planning work (see Chapter 2) involves regular contacts with provincial authorities and coordination through the Vietnam Donor Group on Climate Change Policy & Coordination.
- In **Djibouti**, a new geothermal energy development program (see Box 2.2) involves cooperation between the World Bank Group, the African Development Bank (AfDB), Agence Française de Développement (AFD), the Global Environment Facility (GEF) and the Organization of the Petroleum Exporting Countries Fund for International Development.
- In **Papua New Guinea**, ESMAP support to the development of a National Electrification Roll-Out Plan has included a series of consultations with civil society, utilities and development partners.
- In **India**, under the North Eastern Region Power System Improvement Project, a World Bank team is helping develop the capacity of power utilities under the State Governments of Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura.
- In the **Balkan region**, the Scaling-Up Energy Efficiency in Buildings in the Western Balkans project brings the WBG together with the European Commission and KfW to work with municipal authorities in the region to improve financing, budgeting, procurement and implementation of energy efficiency improvements in buildings.

ESMAP's unique features—its combination of global and country-level work; its ability to leverage the technical and financial resources of the WBG; and its forward-looking mandate—place it

in a good position to continue to play an important role in supporting global energy sector development.

## LEVERAGE AND IMPACT

According to the latest ESMAP Portfolio Review[2], over the five-year business plan period of FY2009 through FY2013, ESMAP contributed to the identification and design of WBG energy sector lending of **$14.7 billion**. These lending operations in turn leveraged a further $15 billion in funding from public, private, and other international sources.

In FY2013 alone, 24 ESMAP activities directly informed WBG lending or the development of client policies or strategies. These include:

- In Egypt, the development of the World Bank's $573 million Helwan South Power Project was complemented by ESMAP technical assistance to the power sector regulator. The aim was to help the regulator and sector utilities to strengthen transparency and public information systems, to establish a basis for a performance benchmarking system, and to improve consumer feedback.
- In Georgia, based on an ESMAP Regional Power Trade study that recommended the need to establish clear power tariff-setting rules and strengthen the framework for transmission allocation, the World Bank approved policy support and is in the process of preparing a $120 million operation that will help develop clear market rules to facilitate power trade and strengthen the transmission grid in preparation for the regional power trade (see Box 5.2 for related work in Armenia).
- In Uruguay, the ESMAP report *A Primer on Energy Efficiency for Municipal Water and Wastewater Utilities* informed a $42 million World Bank loan to improve the reliability and resilience of the water supply and sanitation systems managed by the national utility Obras Sanitarias del Estado.
- In Turkey, the ESMAP activity Facilitating Small and Medium Enterprise Financing for

[2] For the latest ESMAP Portfolio Review and other reports on ESMAP operations, go to the ESMAP website (www.esmap.org) and click on the "Results" tab.

Energy Efficiency carried out bank portfolio market assessments and developed an energy efficiency screening tool allowing Turkish banks to carry out quick evaluations of the financial and technical viability of energy efficiency projects. These in turn informed the design of the World Bank's Turkey Small and Medium Enterprises (SME) Energy Efficiency Project—a $200 million loan to three financial institutions.

- In China, a new $12 million World Bank-GEF project to accelerate the adoption of energy efficiency in urban areas was influenced by the ESMAP-supported study *Low Carbon City Development in China*. Design of the project itself was led by ESMAP, drawing on lessons learned on how urban spatial planning can reduce the energy consumption of cities.
- In Liberia, through the Africa Renewable Energy and Access program (AFREA), ESMAP supported the establishment of the Rural Renewable Energy Agency and the implementation of a market-based solar project as well as a micro-hydropower mini-grid in the remote community of Yandohun, Lofa County. These pilot projects informed the design of the $50 million Renewable Energy Electrification Program (REEP), focusing on renewable mini-grids and stand-alone solar systems.

As well as supporting client countries and informing WBG operations, ESMAP's tools, studies and reports are increasingly being used by World Bank partners and development agencies around the world.

- The Asian Development Bank (ADB) has been deploying the Energy Forecasting Framework and Emissions Consensus Tool (EFFECT) to project transport-sector emissions in Vietnam. The results will help the government build consensus around specific low carbon policies and initiatives.
- The Model for Electricity Technology Assessment (META) tool has been used by the Washington, DC-based Worldwatch Institute to assist the governments of the Dominican Republic, Haiti, and Jamaica in comparing the costs of electricity supply options, including renewable energy (see Chapter 5).
- The Geothermal Training Program of the United Nations University is using ESMAP's *Geothermal Handbook* as part of a postgraduate training program that is helping build the capacity of practicing professionals to carry out geothermal exploration and development.
- ESMAP's Marginal Abatement Cost Tool (MACTool) is being used by the United Nations Development Programme (UNDP) in Ukraine, and by the Inter-American Development Bank (IDB) and by the Ministry of Finance in Brazil to compare the costs and benefits of emission-reduction options.
- A number of local institutions are helping to deliver the Leaders in Urban Transport Planning program (see Chapter 4), including LTA Academy of Singapore, the Korea Transport Institute in Seoul, ctsEMBARQ of Mexico City, and the Academy of Mayors in Beijing.
- Lawrence Berkeley National Laboratory in the United States has adapted the Tool for Rapid Assessment of City Energy (TRACE; see Chapter 4) for use in Chinese cities by adding modules on greenhouse gas (GHG) emissions and industrial energy efficiency, and an expanded set of possible interventions.

## LESSONS LEARNED

A comprehensive external evaluation of ESMAP's program, activities and effectiveness for the period FY2007–11 was conducted in FY2012. At the end of that year, ESMAP formulated a management response to the evaluation and has since incorporated many of its recommendations into ESMAP operations as well as the new Strategic Business Plan for FY2014–16.

Among the recommendations was a call for an increase in cross-sectoral work looking at emerging issues of concern for clients. In response, ESMAP has started collaborating with the World Bank's transport and water operational units to develop activities that relate to energy efficiency in transport and water systems. ESMAP is also supporting new analytical work on the energy-water nexus that specifically looks at how water constraints impact energy systems (see Chapter 5).

In response to the recommendation that ESMAP mainstream gender and social considerations into project planning and implementation, resource material has been developed for use by World Bank teams in the development of energy projects and programs (see Chapter 3). These resources will be used in FY2014 as part of the new ESMAP focus area on gender and social inclusion, which looks beyond household energy and access issues to incorporate gender considerations into a wide range of energy sector programs.

ESMAP has also improved its monitoring and evaluation (M&E) systems in response to stakeholder feedback. All activities now clearly define expected outputs and outcomes at inception. Proposed activities also include specific baseline and target values, articulate direct or indirect linkage to global thematic challenges and the Business Plan, as well as specify any social and/or gender aspects.

A comprehensive online system has been developed to monitor the results of ESMAP activities. This M&E Portal was made fully operational in FY2013, enabling donors and other external stakeholders to track the progress of activities in real time through a database and map interface. Information on results is also being made publicly available in other forms, such as the annual Portfolio Reviews and a series of 'impact stories' that link ESMAP activities with results on the ground.

ESMAP has had a combined communications, web, and publications team in place since FY2012. This team has developed a new communications strategy for the program, revamped the program website to reflect ESMAP's reorientation and new audiences, instituted new publications guidelines, and created a new series of publications. Communications are now integrated into all major ESMAP initiatives, and a new dissemination protocol ensures that knowledge products reach a wider and more diverse audience.

This work is now expanding to embrace new channels of communication, including peer-reviewed journals and social media. At the same time, ESMAP news stories and publication announcements are being increasingly integrated into WBG online channels to reach substantially larger international audiences and ensure that ESMAP's work contributes more effectively to the ongoing global dialogue on energy and development.

## NEW BUSINESS PLAN

ESMAP's new Strategic Business Plan, which covers FY2014–16, was the result of extensive discussions with ESMAP's Consultative Group of donors and its Technical Advisory Group (see Box 1.1). It maintains the reorientation started in the previous Business Plan, and takes into account new client priorities and rapidly changing dynamics in the global energy sector.

To reinforce ESMAP's position to support and influence these developments, the Business Plan lays out the following main objectives:

BOX 1.1

### ABOUT ESMAP

ESMAP is a global technical assistance program administered by the World Bank and situated in the World Bank's Sustainable Energy Department in Washington, DC. ESMAP's program includes both regional and country-focused activities implemented by the regional units of the World Bank, and global initiatives managed by the ESMAP program unit. The ESMAP core unit of about 25 staff is responsible for the day-to-day management of the program, following the strategy laid out in ESMAP's Business Plan. The unit comprises teams working on energy access, clean energy, energy efficient cities, energy assessments and strategy, results-based approaches for energy sector development, gender, small island developing states, communications, and monitoring and evaluation.

### Consultative Group

ESMAP is governed by a Consultative Group (CG) made up of representatives from contributing donors and chaired by the Director of the World Bank's Sustainable Energy Department, on behalf of the Vice President of the World Bank's Sustainable Development Network (SDN). The CG meets annually to review the strategic direction of ESMAP, its achievements, use of resources, and funding requirements.

ESMAP's donors in FY2013 were:

| | | | |
|---|---|---|---|
| Australia | France | Lithuania | United Kingdom |
| Austria | Germany | Norway | The World Bank Group |
| Denmark | Iceland | Sweden | |
| Finland | Japan | The Netherlands | |

### Technical Advisory Group

A Technical Advisory Group (TAG) of international experts appointed by the CG provides informed, independent opinions to the CG about the purpose, strategic direction, and priorities of ESMAP. The TAG also provides advice and suggestions to the CG on current and emerging global energy sector issues likely to impact ESMAP's client countries.

BOX 1.2

## ESMAP KEY ACHIEVEMENTS FY2013

- Co-authoring of the *Global Tracking Framework* report, which sets the global baseline for the three overall Sustainable Energy for All (SE4ALL) goals, together with the World Bank's Sustainable Energy Department and the International Energy Agency (IEA).
- Launch of the Global Geothermal Development Plan to catalyze a 'transformational' scale-up of geothermal energy by identifying and developing test drilling projects and mobilizing bilateral and multilateral financing for the riskiest phase of geothermal development.
- Expansion of deployment of the Tool for Rapid Assessment of City Energy (TRACE) from 11 cities in FY2012 to 25 cities in FY2013, to help major urban centers such as Accra, Nairobi, and Rio de Janeiro assess their options for improving energy efficiency.
- Launch of the Renewable Energy Resource Mapping initiative, which will identify locations of high potential for solar, wind, biomass and small hydropower at a national scale, with nine country projects approved in the initial stage.
- Launch of the $15 million SE4ALL Technical Assistance Program to help high-potential developing countries achieve universal access to electricity and/or modern cooking fuels by 2030. As of June 2013, country-specific technical assistance was underway in Burundi, Guinea, Liberia, Mozambique, and Senegal; with the program expected to expand to Asia and Central America in FY2014.
- Work with clients and partners to disseminate and further develop the Model for Electric Technology Assessment (META), which has been used in electricity planning in Haiti and Jamaica as well as by a number of universities around the world.
- Continued support to the Lighting Africa program, which has reached nearly seven million people in Sub-Saharan Africa with clean and improved lighting products.
- With the Africa Energy Unit of the World Bank, launch of the Africa Clean Cooking Energy Solutions (ACCES) initiative in the Democratic Republic of Congo, Senegal, and Uganda which aims to replicate Lighting Africa's success by transforming the market for clean household fuels in a region where 700 million people still depend on traditional biomass to meet their cooking needs.

1. **Enhance Development Financing.** ESMAP will provide client countries with technical assistance for pre-investment activities necessary to focus on program design issues and offer additional options.
2. **Influence Policy and Strategy and Increase Client Capacity.** ESMAP will seek to increase the institutional capacity of client countries to plan, manage, and regulate the implementation of policies and programs that deliver the reliable and affordable energy services required for poverty reduction and environmentally sustainable economic growth.
3. **Deepen Knowledge and Generate Innovative Solutions.** ESMAP-supported research and assessments will aim to strengthen the sector's knowledge to deliver increased energy access, energy efficiency, and sustainable energy services in developing countries.

BOX 1.3

## THE SUSTAINABLE ENERGY FOR ALL *GLOBAL TRACKING FRAMEWORK* REPORT

Although 1.7 billion people gained access to electricity between 1990 and 2010, the rate was only slightly ahead of the population growth of 1.6 billion over the same period. About 1.2 billion people—almost the population of India—still live without a connection to electricity in their homes. Getting the world to universal electricity access by 2030 will require an additional $45 billion in investment every year, five times the current annual level.

That is just one of the findings of a unique report co-authored by the World Bank, ESMAP, and the International Energy Agency (IEA), in partnership with 13 other agencies. The *Global Tracking Framework* report, released at the Vienna Energy Forum in May 2013, is the first of a series that monitors progress towards the three goals of the SE4ALL initiative: universal energy access, doubling the share of renewables in the global energy mix, and doubling the rate of improvement of energy efficiency—all by 2030.

The report assigns numbers to those three objectives and identifies what needs to change to achieve them.

The report identifies 20 "high-impact" countries—all in developing Asia and Sub-Saharan Africa—that account for two-thirds of the global population of those who lack electricity, and three quarters of the 2.8 billion people who have to rely on wood or other biomass to cook and heat their homes. The resulting air pollution causes about 4 million premature deaths a year, most of them women and children.

While final energy consumption from renewable sources grew at 2 percent per year between 1990 and 2010, this was only slightly ahead of the growth in final energy consumption from all sources. As a result, the proportion of the world's energy mix from renewable sources only rose slightly, from 16.6 percent in 1990 to 18 percent in 2010.

Another 20 high-impact countries—mostly OECD countries but also including China and India—account for 80 percent of energy consumption and will need to lead the way on doubling the share of renewables to 36 percent of the global energy mix and doubling the rate of energy efficiency improvement.

World Bank Vice President for Sustainable Development Rachel Kyte said that the *Global Tracking Framework* is a milestone for the SE4ALL initiative, which was launched by UN Secretary General Ban Ki-moon in 2011.

"It provides baseline information on where we are in the journey toward meeting global energy goals," Kyte said. "Everyone will be able to measure their progress from the baseline. And we know that's important, because what gets measured is what gets done."

*(continues on next page)*

BOX 1.3 (*continued*)

The report estimates that existing investments in energy totaling about $409 billion a year need to more than double to achieve the three goals. An additional $600–800 billion is needed, the report says, including $394 billion for energy efficiency and $174 billion for renewable energy.

The report was co-authored by ESMAP and the World Bank's Sustainable Energy Department, together with the IEA. Thirteen other agencies supported the report and contributed to its production: the Global Alliance for Clean Cookstoves (GACC), the International Institute for Applied Systems Analysis (IIASA), the International Partnership for Energy Efficiency Cooperation (IPEEC), the International Renewable Energy Agency (IRENA), Practical Action, the Renewable Energy Policy Network for the 21st century (REN21), the United Nations Energy Knowledge Network, the United Nations Foundation, the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), the United Nations Industrial Development Organization (UNIDO), the World Energy Council (WEC), and the World Health Organization (WHO).

The Business Plan maintains ESMAP's organization into four main areas of focus:

- **Clean Energy** – including renewable energy, smart grids, and climate adaptation of energy systems (Chapter 2)
- **Energy Access** – including rural electrification, clean cooking, and improving access for the urban poor (Chapter 3)
- **Energy Efficiency** – the Energy Efficient Cities Initiative (EECI) as well as analytical work on efficiency in water, transport, and other sectors (Chapter 4)
- **Energy Assessments and Strategies** – including sector-wide advisory services and technical assistance on energy policy, governance, and institutions (Chapter 5)

In addition to these focus areas, ESMAP has launched special initiatives to support small island developing states (SIDS) as they transition to a more sustainable energy future (see p. 26) and to support results-based approaches to energy sector development (see p. 68). Starting in FY2014, ESMAP's gender and energy activities will become part of a new focus area covering social inclusion in the energy sector, with a specific initial focus on gender.

The core of ESMAP's work program will continue to be conducted through grants to the World Bank's regional energy units for analytical and advisory activities linked to the Bank's country policy dialogue and investment lending programs. These annual block grants (ABGs) will be supplemented by targeted regional programs such as the second stage of AFREA (see Chapter 3) and global initiatives such as the SE4ALL technical assistance program and Renewable Energy Mapping (see Chapter 2), in which country-level activities will also be implemented by the Bank's regional teams.

The Business Plan takes into account the wide variety of country contexts that the World Bank operates in, and the different energy needs and challenges faced by client countries in each region.

In **Africa**, expansion of the energy sector continues to be a key development priority for governments. Challenges include inadequate generation capacity, low access rates, and unreliable energy supply. The investment needs are enormous. Currently, about 1–2 gigawatts (GW) of new installed capacity is deployed annually, but Africa needs 6–7 GW of new capacity every year. Electricity access has grown merely 1 percent per year, and nearly 80 percent of households still rely on solid biomass for cooking. It is estimated that Africa needs up to $40–50 billion yearly to reach universal access by 2030. The World Bank is actively cooperating with partners under the SE4ALL initiative to help countries in the region achieve universal energy access (see Chapter 3). Other assistance includes support to power sector planning; development of transformational generation projects; leveraging private sector investments; building the capacity of regional power pools; and improving the efficiency of utilities.

In **East Asia and the Pacific**, the focus is on energy security, scaling up energy efficiency and renewable energy, expanding access to modern energy, and advancing sustainable urban energy. The region is highly diverse, ranging from low-income countries with limited access to modern energy services to upper middle-income countries in advanced stages of power sector reform and with sophisticated competitive markets. In low-income and remote areas, the World Bank's engagement will focus on extending electricity access, enhancing policy and regulatory frameworks, and building capacity. In middle-income countries, the emphasis will be on analytical work, targeted sector engagements, and policy dialogue.

In **Europe and Central Asia**, the principal challenges include high energy intensity (the region accounts for 5 percent of the world's GDP and 10 percent of energy consumption); supply shortages; aging energy infrastructure, especially for power generation and district heating; a lack of financial viability in the energy sector; and vulnerability of energy production to climate impacts, especially for hydropower dependent countries. Work increasingly focuses on expansion of energy efficiency and support for energy tariff and subsidy reforms.

In the **Latin America and Caribbean** region, challenges include the need to scale up investments in power generation capacity and reduce dependence on costly fuel oils for producing electricity. Many countries in the region are trying to develop indigenous energy resources, including hydropower, wind and geothermal. The World Bank's engagements in the region vary depending on the country context and priorities. Work focuses on scaling up capacity and improving the generation mix, as well as regional energy integration, and improving resilience to deal with volatile oil prices and climate change. Energy efficiency is

becoming more of a priority, especially in urban areas of the region's more developed economies.

In the **Middle East and North Africa**, a wide-scale effort to build capacity, institutions and improved infrastructure is needed to meet growing energy demand while also emphasizing decentralization and service delivery. The World Bank's engagement includes work on fuel subsidies, introduction of clean technologies, electricity and gas market reforms, energy efficiency, regional integration, and gender-responsive development actions.

The power sector in the **South Asia** region remains weak and unstable, with power shortages levying a very high cost in terms of reduced economic development, job losses, and disincentives to broaden access to electricity to those not yet connected. At the same time, financial losses in the power sector are mounting due to misalignment of tariffs with cost of supply; high cost of power procurement; and high transmission and distribution losses. All South Asian countries share a high dependence on fossil fuels, a large part of which is imported. The World Bank's energy work in the region focuses on promoting access to and reliability of energy services; facilitating investments in clean energy; and improving domestic and regional energy markets.

BOX 1.4

## ESMAP AT 30

The Energy Sector Management Assistance Program was set up in 1983 in response to the global energy price shocks of the previous decade. Since then, ESMAP has moved from being a small program focused on giving targeted advice to oil-importing countries to one of the WBG's most established trust-funded global programs, mandated with helping developing countries find solutions to a wide range of energy challenges.

Originally a joint UNDP-World Bank partnership within the World Bank's Industry and Energy Department, ESMAP's first years were spent working directly with client governments to assess energy sectors and design and implement new programs and strategies. Over the years, ESMAP evolved into a global knowledge and technical assistance program, administered by the World Bank, which provided innovative analytical and technical studies for the Bank's newly created Regional Departments.

Rohit Khanna, ESMAP's current Program Manager, noted that while the basic features of ESMAP's work—providing strategic advice and technical assistance—has remained constant over the past three decades, the program has also evolved in order to tackle a range of ever-changing energy challenges.

"ESMAP has grown with the complexity of the energy sector," Khanna said. "What began as a collective response to the energy price increases of the 1970s has become a much more diversified agenda covering everything from household energy to climate change to smart grids."

In the mid-1980s, ESMAP was among the first organizations to prioritize household energy. A decade later it was at the forefront of helping countries develop rural energy and energy efficiency programs and enact regulatory reforms.

"Looking back over the past three decades, one finds that so much of what the World Bank has accomplished in the energy sector can be traced back to some ESMAP assessment, report, or analysis that got an idea going or provided the evidence to persuade a client to do something," said Khanna.

Whether by supporting Lighting Africa to expand clean, off-grid lighting systems in Sub-Saharan Africa, helping strengthen national and regional electricity markets, or working with governments to assess their low carbon development options, ESMAP's analytical and advisory activities continue to make a tangible difference in the lives of people around the world.

CHAPTER 2

# ACCELERATING THE TRANSITION TO CLEAN ENERGY AND LOW CARBON DEVELOPMENT

According to the *Global Tracking Framework* report that sets a baseline for the three SE4ALL goals (see Box 1.3), 18 percent of the world's final energy consumption came from renewable sources in 2010. However, much of that was in the form of traditional biomass, such as wood and animal waste. Of the rest, the majority came from hydropower. Other renewable sources still contribute barely over 1 percent of total final energy consumption. It is clear that a concerted global effort, and a substantial increase in financing, will be required to meet the SE4ALL goal of doubling the share of renewable energy in the global energy mix by 2030.

This challenge is now being addressed. Developing countries are increasingly turning to renewable energy in response to a range of pressures, including the need to eliminate energy poverty, shore up energy security at a time of global energy market volatility, reduce the fiscal burden of importing expensive fossil fuels, and improve the sustainability of supply over

the long term. While renewable energy expansion has slowed down or leveled off in some developed countries lately due to substantial subsidy cutbacks in these times of fiscal constraint, renewable energy capacity is expanding and expected to continue to grow in Africa, Asia, and Latin America thanks in part to falling prices of renewable energy technologies, bringing many closer to parity with fossil fuels. However, for many of these countries, electricity grids need to be updated and adapted to handle additional renewable sources of supply (see Box 5.1).

ESMAP is committed to helping its developing country clients not only understand and respond to current needs, but also to plan and prepare for future challenges. In particular, ESMAP is scaling up its clean energy program with targeted interventions that can catalyze action by clients, the private sector, and development partners. These new programs focus on specific knowledge barriers or resource risks that hinder the uptake of renewable energy options.

## FY2013: HIGHLIGHTS AND ACHIEVEMENTS

### Global Geothermal Development Plan

For many low- and middle-income countries, geothermal energy is an underutilized resource with great potential. From Africa's Rift Valley to South America's Andes to the islands of Asia and the Pacific, a number of countries have geothermal endowments that could meet a significant portion of baseload energy demand. The benefits would include increased energy access and security, more affordable and reliable power, and decreased GHG emissions.

### ACHIEVEMENTS IN FY2013 UNDER THE CLEAN ENERGY PROGRAM

- Launch of the Renewable Energy Mapping initiative, which will identify locations of high potential for solar, wind, biomass, and small hydropower at a national scale, with nine projects approved in the initial stage
- Publication of the *Geothermal Handbook*, a comprehensive look at the phases of geothermal development and the policies, institutions, and financing mechanisms needed for successful projects
- Launch of the Global Geothermal Development Plan to catalyze a 'transformational' scale-up of geothermal energy in developing countries by focusing resources from the WBG and other multilateral and bilateral donors towards test drilling, the riskiest phase of geothermal development
- Publication of *Planning for a Low Carbon Future: Lessons Learned from Seven Country Studies*, which summed up five years of studies of low carbon development options in major emerging economies
- Completion of the Renewable Energy Training series for World Bank Group staff and stakeholders, with eight modules on up-to-date developments in renewable technologies, policies, infrastructure, and financing
- Creation of the Smart Grids Knowledge Exchange Portal, an online resource for the latest information and lessons learned on smart grids, to assist World Bank teams as clients increasingly seek these technologies

In recognition of this importance, geothermal energy has played an increasing role in ESMAP's portfolio since FY2011. In October 2012, ESMAP published the *Geothermal Handbook: Planning and Financing Power Generation*. This flagship study presents the phases of geothermal project development, examining the risks involved and the policies, institutions, and financing mechanisms needed to successfully bring projects to fruition. The handbook also stresses the importance of concerted international assistance to help finance geothermal scale-up in the early, risky phases of development.

Following on this, ESMAP launched the **Global Geothermal Development Plan** (GGDP) to catalyze a major scale-up of geothermal energy in developing countries. Announcing the initiative in Iceland in March 2013, World Bank Managing Director Sri Mulyani Indrawati noted that geothermal energy could prove "transformative" by providing "clean, low-cost, locally produced baseload power." The $5 million program will support the identification and development of geothermal test-drilling projects.

The ESMAP initiative differs from previous efforts in that it focuses on the primary obstacle to geothermal expansion: the high up-front cost and risk of test drilling. Validating the availability of commercially viable geothermal resources is an unavoidable step often requiring $15–25 million per field, in risky, years-long investment. Public financing has therefore been the main channel to support this initial stage. The GGDP is designed to mobilize roughly $500 million in concessional financing from diverse sources, including bilateral donors, multilateral development banks and international climate change facilities, to finance the pipeline of investment-ready projects identified by ESMAP and its partners through the GGDP.

ESMAP has already identified an indicative 36 fields in 16 countries where surface exploration has been completed and financing is needed to confirm the sites' commercial viability. And the first test-drilling project under the GGDP is now ready to go ahead, with the approval on June 2013 by the World Bank Board of Directors of a project in Djibouti to assess the commercial

geothermal potential of the Fiale Caldera within the Lake Assal region, with ESMAP contributing $1.1 million (see Box 2.2).

## Mapping the Renewable Energy Revolution

In the case of other renewable sources such as solar and wind, even when countries have the financing to move forward, they are held back by a lack of detailed data on sites with the greatest potential to generate power. A global ESMAP initiative launched in FY2013 aims to fill that information gap.

The **Renewable Energy Mapping** initiative will produce the maps needed by governments and project developers to identify resource 'hot spots' at a national scale. The initiative will cover resource mapping for solar, wind, biomass, and small hydropower potential and currently has a budget of $11.6 million. Nine country projects have been approved in its initial stage: Indonesia, Lesotho, Madagascar, Maldives, Pakistan, Papua New Guinea, Tanzania, Vietnam, and Zambia.

The projects funded by ESMAP will go beyond standard satellite-based mapping to produce high resolution resource atlases that are validated through ground-based data collection from surveys, site visits, stream gauges, solar stations, and wind masts. This will allow governments to identify which areas of their countries have the best potential for further site-specific assessment, and to better understand the costs of development, while also reducing investment risks in financing renewable projects.

As well as mapping, the initiative will support geospatial planning to assist governments with development zoning and to mitigate any adverse impacts through strategic environmental assessment and other planning tools. It will also help consolidate existing country datasets and build the capacity of local institutions in this field. All data commissioned through ESMAP projects will be made freely available through a web portal and will be linked into web-based data repositories such as the Global Atlas hosted by the International Renewable Energy Agency (IRENA).

Initial mapping work will start in late 2013, with ground-based measurement campaigns to take place from 2014.

## Low Carbon Development: Targeted Country Engagement

In FY2012, ESMAP wrapped up the first stage of its **Low Carbon Growth Country Studies** program, which looked at long-term strategies whereby major emerging economies could reduce GHG emissions while maintaining economic growth objectives. Starting in 2008, studies were carried out in Brazil, China, India, Indonesia, Mexico, Poland, and South Africa.

In November 2012, ESMAP published a major report that summarized the main findings of five years of work. ***Planning for a Low Carbon Future: Lessons Learned from Seven Country Studies*** compared the different low carbon planning approaches used in the various countries, and provided recommendations for governments going forward. Among these were the need to build stakeholder consensus from the beginning of the planning process, the importance of uncovering interventions that will pay for themselves, and the importance of continuing to invest resources in data, tools, and modeling.

BOX 2.1

## MEASURING THE CUMULATIVE IMPACTS OF HYDROPOWER IN TURKEY

Turkey has made impressive strides in recent years in boosting private sector investment to develop the country's extensive renewable energy resources. The push for investment in Turkey's wind and hydropower assets began in 2003 with landmark legislation that liberalized the energy sector. Other reforms quickly followed that accelerated the growth of renewables and resulted in an upsurge in privately generated electricity. By 2012, independently owned renewable generation facilities were producing over 26,000 GWh of electricity, a 17-fold increase over levels a decade earlier.

The government's privatization efforts were particularly successful in Turkey's hydropower sector. The rapid increase in privately funded small- and medium-sized hydroelectric power plants helped Turkey develop more reliable and efficient energy supply as well as progress towards its goal of producing 30 percent of total energy from renewables by 2023.

At the same time, the upsurge of private-sector investment in renewables prompted a dialogue on natural resource and water management policy, particularly with regard to the cumulative environmental impacts of hydropower projects. Cumulative impacts are changes to the environment caused by a project in combination with other past, present and planned projects and activities. These impacts included increased risk of erosion and landslides, disruption of water flow, and destruction of flora and fauna. Although Turkey's government had a strong Environmental Impact Assessment (EIA) regulation in place, it contained no specific provisions requiring the assessment of cumulative impacts.

In 2010, the Ministry of Environment and Urbanization requested World Bank assistance in developing a methodology to integrate Cumulative Environmental Impact Assessments (CEIAs) into the planning and execution of future hydroelectric power projects.

The result was the ESMAP-supported report *Cumulative Environmental Impact Assessment for Hydropower Projects in Turkey*, a first-of-its kind undertaking designed to ensure that the rapid development of hydropower plants was consistent with environmental sustainability.

Published in early 2013, the study was the result of an 18-month process that included six workshops and consultations with stakeholders, including public authorities, international finance institutions, and non-governmental organizations (NGOs). Built around a Pilot Basin case study in Turkey's Upper Ceyhan Basin, the study presents guidelines for conducting a CEIA, including practical examples and different approaches to take.

The new CEIA guidelines complement the Private Sector Renewable Energy and Energy Efficiency Project introduced by the World Bank in 2009 to help Turkey increase privately owned and operated energy production from renewable sources and enhance demand-side energy efficiency. The Ministry of Environment and Urbanization has started to incorporate CEIA assessments as part of the EIA process when developing new hydropower plants, and, in future, the guidelines could be utilized as part of an integrated basin-management planning process.

ESMAP is also continuing to support World Bank engagement with countries on low carbon development that is targeted to specific national contexts and sectors.

In Nigeria, ESMAP supported a comprehensive evaluation of the national power sector in order to understand how the country could expand electricity access while reducing the energy intensity of the economy. Nigeria's power grid is characterized by insufficient capacity to meet demand, shortages of natural gas for power generation, and limited transmission and distribution coverage. These problems result in unreliable grid operation and frequent load shedding. The study lays out an alternative low carbon scenario that would enable Nigeria to improve this situation at lower overall long-term cost through a more diversified mix of generation sources and a more balanced supply across regions. Elements of the scenario include energy efficiency measures, particularly in lighting; the demonstration of renewable energy projects; and the substitution of gas turbine generators for inefficient, high carbon off-grid diesel and gasoline generators.

ESMAP is continuing to work with a number of national institutions and external donors in Vietnam on modeling low carbon options for various sectors in that country[3]. This work is increasingly focusing on developing options for the government to phase out distorting fossil fuel subsidies while phasing in social protection measures for the poor. While work is continuing in other sectors, avoiding the growth of such subsidies in the future has been identified as having the greatest potential to help the Vietnamese economy move towards a green growth path. As well as encouraging non-economic use of fossil fuels, the subsidies have also been a fiscal burden, and have proved to not help their intended recipients among

[3] See ESMAP 2012 Annual Report, Box 2.1.

BOX 2.2

## PROMOTING GEOTHERMAL DEVELOPMENT AROUND THE GLOBE

With the launch of the Global Geothermal Development Plan (GGDP), ESMAP has reached out to support promising early-stage geothermal projects in Africa, Central America, and the Caribbean.

In June 2013, the World Bank Board of Directors approved a $6 million International Development Association (IDA) credit towards a $31 million project to assess the commercial geothermal potential of the Fiale Caldera in Djibouti.

Half of Djibouti's population does not have access to electricity due to high tariffs, high connection costs, and an electricity grid that covers only Djibouti City and its outskirts. The project is the first phase of a two-step process to develop local geothermal generation capacity and could help Djibouti fully meet its peak demand, alleviate energy dependency, and reduce electricity production costs by 70 percent.

The donor-supported exploration phase will assess whether large-scale power generation is possible. ESMAP support will go towards contracts for inspecting and testing the wells during the drilling phase. This will be followed by competitive tendering for development of an estimated 56 MW geothermal power plant by private power producers.

If successful, the project is expected to lower the cost of domestic electricity production from 24 US cents per kWh to 10 US cents per kWh, and make the supply of energy more secure. Replacing Djibouti's thermal generation capacities with geothermal would mean significant savings for the state power utility, Electricité de Djibouti (EDD), reducing the financial burden on the national budget posed by power generation.

ESMAP has also provided a grant of $1.6 million to the World Bank's Latin America and Caribbean regional energy unit for a comparative assessment of geothermal risk mitigation schemes and identification and development of two to three exploratory drilling projects. Also included will be an analysis of the general and specific drivers of and barriers to geothermal energy development in the region and a review of the sector policy incentives, public development plans, and business models already in place.

In Dominica, ESMAP has supported production of a gap analysis report to help the Government of the Commonwealth of Dominica determine the additional tasks necessary to advance development of its Wotten Waven geothermal field. The review indicates that there are sufficient geothermal resources to develop a small power plant for the domestic market, but that prospects for doing so can be enhanced through additional scientific investigations.

poorer communities. A final report, including a low carbon reference scenario for the national economy, is to be delivered to the government in 2014.

### Training for Next-Generation Renewable Energy Operations

As developing countries look more and more to incorporating renewable sources in their energy mix, demand has grown from WBG clients for advisory and expert services in this area. Client needs go beyond the understanding of discrete power generation options to encompass areas such as integration of renewable energy sources into electricity grids, financial support mechanisms, and policy and regulatory instruments for the promotion of those technologies.

Throughout FY2012 and FY2013, ESMAP, in collaboration with the Advisory Services of the International Finance Corporation (IFC), conducted a comprehensive **renewable energy training program** targeted at WBG staff. The objective was to prepare them to better advise clients in the areas of policy development and structuring of public and private investment operations. The series began with courses on wind power and solar photovoltaic power held in FY2012. These were complemented with six further modules held between July and December 2012: geothermal energy; policy incentives and support mechanisms; financing options; grid integration, transmission and distribution; concentrated solar power; and biofuels.

The training program focused on all aspects of project development, including case studies and lessons from operations around the world. Speakers included a wide array of WBG experts as well as outside speakers from academia, international organizations, and private companies. Training sessions were delivered in face-to-face modules that were also broadcast online for staff in country offices. A total of 250 WBG staff took part in the program. Selected outside participants from client countries were also invited to join the sessions.

### Smarter, More Resilient Grids

Electricity grids sit at the heart of national energy sector management, as grids bring power to the expanding cities and industries that drive economic development. Recent high-profile power shortages and grid failures demonstrate that these systems are under stress in both the developed and developing worlds, prompting increasing calls to make grids more resilient, reliable, and "smarter."

In September 2012, ESMAP launched an **online smart grids platform** to provide WBG staff with well-organized and operationally relevant information on smart grids. The platform has since been used by World Bank teams in support of clients, and has become a repository on smart grid technologies, policies, and regulations. This work also resulted in the development of a Smart Grid Roadmap Methodology to help clients understand how to define the modernization priorities for their transmission and distribution grids.

The smart grid team supported by ESMAP also provided direct inputs to specific World Bank country-level engagements. In Vietnam, an identification mission defined the options for a smart grid modernization lending operation in support of the country's transmission corporation. In the Philippines, the team helped the National Grid

Management Commission define requirements and performance standards for variable renewable energy sources being integrated into the national grid (see Box 5.1).

### Adapting for the Future: Climate Risks

ESMAP also continues to support work on the vulnerability of energy systems to climate risks, following on a major report it published on the subject in 2011. There is a growing awareness of the urgency of this issue: 9 out of the 18 major energy shortages in the world between 2000 and 2010 were due to drought, and extreme weather events are beginning to hit energy supply in countries as diverse as Australia, China, and South Africa.

Development of the **Rapid Assessment Tool for Climate Change Vulnerability of the Energy Sector** was completed in FY2013. The tool provides a high-level, systematic analysis of the vulnerability of energy sector to climate change and adaptive capacity as well as high-level adaptation options. Such assessments can help build consensus among key national energy stakeholders and identify priority areas for further intervention.

Rapid assessments have been carried out in Nepal, Vietnam, and Zambia and are under way in Mozambique. In Vietnam, the assessment found high vulnerability to climate change impacts but also high adaptive capacity. The vulnerabilities included small reserve margins in Vietnam's electricity system to produce electricity during peak load periods and the location of fossil fuel power plants in areas of high water stress. Among the options recommended by the assessment were an

upgrade of design codes for energy assets against projected climate changes, and improved data collection, analysis, and monitoring of climate-related impacts. The assessment in Zambia, by contrast, found both high vulnerability and low capacity to adapt, and recommended international assistance to build adaptive capacity and define and implement adaptation measures.

## FY2014 AND BEYOND: NEW INITIATIVES

ESMAP's work plan for the Clean Energy program for FY2014 and beyond recognizes that the outlook for renewable energy in developing countries has changed markedly in the past few years. Equipment markets are more mature; costs are decreasing for several technologies; and most countries have established renewable energy expansion targets, facilitating the mobilization of public support and private investment.

To enhance the capacity of World Bank staff and key development partners, ESMAP will continue its renewable energy training program, focusing on broadening the training audience to client representatives and field staff from the WBG and development partners. Material from the training modules will be actively disseminated to ensure adoption of practices in renewable energy operation design and implementation.

Complementing the training program, ESMAP will build on the experience of the Renewable Energy Toolkit developed in 2006 to create a Project Resource Center for Renewable Energy. This will be an online repository of reference project documents to assist WBG staff, other development institutions, and country counterparts in improving the design and implementation of renewable energy projects. The Project Resource Center will be operationally oriented to address practical implementation needs at each stage in the project cycle and will include case studies, sample terms of reference, and examples of financial and economic assessments. In order to promote broad collaboration and crowd-sourcing, the resource center will be developed on an open platform and will be flexible in its evolution as new types of reference documents are identified. The Project Resource Center is being built in cooperation with Energypedia.info, an open access wiki site focused on clean energy issues in the context of development cooperation.

ESMAP will refocus its work on low carbon development with new objectives to (i) support the dissemination and deployment of cutting-edge analytical tools and datasets related to energy use and supply through, for example, the World Bank's Climate-Smart Planning Platform; (ii) strengthen the capacity of external providers to deploy these tools; and, (iii) provide dedicated resources to the World Bank regions for selectively carrying out low carbon development planning in the energy sector. As part of this work, low carbon energy assessments will be undertaken in a selected group of priority countries where there is the most potential for policy change and/or the development of new planning or analytical methodologies. ESMAP is also piloting an online platform for open-source energy planning tools.

Building up the resilience of energy systems is expected to be an increasing focus for ESMAP going forward, in the recognition that it will help

the energy sector to more ably prepare and respond to natural disasters and unusual weather events in the short term and adapt to climate change in the long term. New programs such as Renewable Energy Mapping and the GGDP are also expected to expand. The business model for the mapping initiative allows for a significant scaling up to accommodate additional demand through the use of standardized project materials and processes and a strong network of specialist providers and experts. This would represent a significant expansion of ESMAP's support for country-level activities, given the need for ground-based data collection, geospatial analysis, and strategic environmental assessment.

Following the launch of the GGDP, ESMAP has started joint work with multilateral and bilateral development agencies and banks to identify and develop test-drilling projects, and is exploring opportunities to mobilize concessional resources to co-finance these resource validation investments. ESMAP has also led the preparation of a $115 million proposal for a Utility Scale Renewable Energy Private Sector window focused on geothermal energy resource risk mitigation, which was approved by the Clean Technology Fund in October 2013. ESMAP is also supporting technical assistance and analytical work on geothermal energy resource assessment investments, starting in Latin America, which is expected to expand to other regions.

## HELPING SMALL ISLAND STATES SECURE A STABLE ENERGY FUTURE

Small Island Developing States (SIDS) are often highly dependent on imported fossil fuels to meet their energy needs. Despite considerable renewable energy potential—solar, wind, ocean, geothermal, and biomass—many SIDS are limited in their ability to transition to sustainable energy pathways by the existing structure of their energy sectors, including inadequate institutional capacity and investment climate for the private sector.

Launched by ESMAP in September 2011 in partnership with UNDP and the Alliance of Small Island States (AOSIS), the **SIDS DOCK Support Program** is assisting small island states put their energy sectors on a more sustainable footing by building their knowledge base and their regulatory, institutional, and human capacity.

The program is funded through a $7 million contribution from the Government of Denmark. In FY2013, the Government of Japan also pledged a contribution of $9 million.

ESMAP's work under the program focuses on two outcomes: (1) renewable energy and energy efficiency policy reform, and (2) implementation of renewable energy and energy efficiency projects that demonstrate the potential for scale up through climate finance and other sources of funding.

As of June 2013, the ESMAP-funded portfolio spanned eight projects in the Africa, Caribbean, and Pacific regions, as well as three global activities. Among these are:

### VIRTUAL NETWORK TO SUPPORT SIDS DOCK PLATFORM

ESMAP is financing creation of a virtual knowledge network designed to be a repository of energy efficiency and renewable energy resources for SIDS. The network will facilitate knowledge exchange between SIDS and their partners. In FY2013, ESMAP support helped develop the prototype platform. Trainings on the uses and advantages of the virtual knowledge network were held in St. Lucia in March 2013, Fiji in May 2013, and Cape Verde in July 2013. ESMAP is in dialogue with IRENA about using the network as the knowledge management platform for IRENA's Global Renewable Energy Islands Network (GREIN), which would also serve to facilitate coordination between SIDS DOCK and GREIN.

### SIDS – REVOLVING FUND OPTIONS PAPER

The high up-front costs often required to harness renewable energy resources are difficult for many SIDS countries to overcome. As such, ESMAP is producing a *Financing Mechanism Options Paper* that outlines measures SIDS can take to attract funding for renewable energy programs. The paper, which places a special emphasis on the role of the private sector, is to be completed in October 2013.

### CAPE VERDE ENERGY CONSERVATION AND ENERGY EFFICIENCY PLAN

In Cape Verde, ESMAP is financing development of a National Efficiency Program that will remove barriers to the implementation of energy efficiency programs. This includes preparation of an action plan that diagnoses energy use and energy savings potential in Cape Verde's oil products, firewood, electricity, and water sectors.

### MAURITIUS – PREPARATION OF A GRID CODE, FEED-IN-TARIFFS, AND MODEL ENERGY SUPPLY PURCHASE AGREEMENTS FOR RENEWABLE ENERGY SYSTEMS GREATER THAN 50KW

Current installed renewable capacity in Mauritius, which is mainly hydropower and biogas, accounts for less than 20 percent of total power generation. The Long Term Energy Strategy 2009–2025, prepared by

*(continues on next page)*

the Ministry of Energy and Public Utilities, calls for the development of distributed renewable energy generation systems in Mauritius in the short to medium term. This activity supports the development of a grid code for wind and micro-hydropower; design of feed-in-tariffs for wind, micro-hydropower, biomass and waste-to energy systems; and templates and models for energy supply purchase agreements.

### SAO TOME AND PRINCIPE – POWER SECTOR EFFICIENCY IMPROVEMENTS

The energy sector in Sao Tome and Principe faces critical challenges and has been identified as the main constraint to the country's economic growth. This activity will include engineering studies aimed at reducing technical losses and improving reliability in the electricity sector. It will also include a demand-side energy efficiency study, and a study on improvements of the hydropower plant at El Contador.

### SEYCHELLES - TECHNICAL ASSISTANCE TO SUPPORT EXPANDED PRIVATE PARTICIPATION IN RENEWABLE ENERGY SUPPLY TO THE GRID

The Government of the Seychelles has requested SIDS DOCK support to provide assistance to develop a grid code, feed in tariffs, and energy supply purchase agreements for renewable energy systems for specific renewable energy technologies.

### VANUATU ENERGY SECTOR DEVELOPMENT PROJECT

ESMAP assistance is helping Vanuatu develop an energy roadmap that will provide a framework within which to coordinate government, private sector, and development partner investment in the country's energy sector. Technical assistance is also helping build the capacity of the Department of Energy, Mines and Mineral Resources and the Utilities Regulatory Authority.

Implementation of activities under the SIDS DOCK Support Program was slow at first, particularly because one project had to be dropped due to country sector issues and another was delayed due to delays in grant recipients meeting conditions of an associated World Bank project. In other projects, procurement of consultants' services has taken much longer than anticipated. These issues are now being addressed and portfolio management is also being strengthened to be more proactive in monitoring implementation progress and taking corrective measures.

### THE ASHDEN AWARDS

As part of its support to SIDS DOCK, ESMAP, in conjunction with the Ashden Foundation, inaugurated a new award category for the well-known Ashden Awards, dedicated to innovators from small island states. The award recognizes companies or individuals who have helped their countries boost energy security and sustainability.

Four finalists were chosen for the Small Island Developing States Awards in 2013: the National Development Bank of Palau, for its program to integrate energy efficiency promotion into mortgage lending for new homes; D&E Green Enterprises in Haiti, which produces and sells the EcoRecho stove, a cleaner and more fuel-efficient alternative to the charcoal cookers used by over 95 percent of Haitian households; Vanuatu's Green Power, which has sold over 40,000 affordable solar lanterns since late 2009; and the PPP of Cabeólica in Cape Verde, which has harnessed wind power to help reduce diesel import costs and increase energy security.

Haiti's D&E Green Enterprises and Cape Verde's Cabeólica were selected as winners at an award ceremony held in London in June 2013.

CHAPTER 3

# CREATING PATHWAYS TO SUSTAINABLE ENERGY FOR ALL

Major advances have been made over the past two decades in expanding the benefits of energy to people around the world. Between 1990 and 2010, more than 1.7 billion people—equivalent to the combined population of India and Sub-Saharan Africa—gained access to electricity while 1.6 billion received access to modern cooking solutions.

Nonetheless, the SE4ALL *Global Tracking Framework* report (see Box 1.3) warns that the momentum that made these gains possible will not be sufficient to achieve universal energy access to both electricity and clean cooking by 2030. Despite substantial progress, more than 1.2 billion people still lack access to electricity and some 2.8 billion rely on traditional wood-based fuels to meet their cooking and heating needs. This has immense consequences for human health, well-being, and economic development and threatens attainment of many countries' primary development goals. Energy poverty is clearly linked to a host of significant development ills: 90 percent of the children in Sub-Saharan Africa go to primary schools that lack electricity and 60 percent of African businesses cite access to reliable power as a binding constraint on their operations.

However, the report also finds some grounds for cautious optimism. Twenty "high-impact" countries in Asia and Africa

account for two-thirds of those without access to electricity and three-quarters of those who use solid fuels to cook or heat their homes. A sustained and concentrated push in high impact countries offers much potential to make rapid progress toward the SE4ALL goal of universal energy access. Programs in countries such as Rwanda and Vietnam have proven that rapid electrification is possible. But decisive action—and adequate financing—is required, with the study estimating that a doubling of existing energy investments will be necessary every year until 2030.

With decades of experience in working towards expanding modern, safe, affordable, and sustainable forms of energy and cooking solutions, ESMAP is well positioned to contribute toward attainment of the goal of extending sustainable energy to all.

## FY2013: HIGHLIGHTS AND ACHIEVEMENTS

### Increasing Support to Sustainable Energy for All

Following early analytical work that helped shape the initial development of SE4ALL[4], ESMAP scaled up its support to the global initiative in FY2013, both through knowledge work[5] and a number of country-level and regional technical assistance activities.

The most prominent of these contributions is a new $15 million Technical Assistance Program designed to help countries set up their own programs to achieve universal energy access by 2030. In FY2013, Burundi, Guinea, Liberia, Mozambique, and Senegal subscribed to the program, and each is now receiving assistance to develop a country-specific energy action plan and investment prospectus. These will prioritize the actions and investments needed for each country to scale up access to electricity and/or clean cooking. The investment prospectus will be a collaborative effort with development partners, with a view to

**KEY ACHIEVEMENTS IN FY2013 UNDER THE ENERGY ACCESS PROGRAM**

- Launch of the $15 million SE4ALL Technical Assistance Program to help countries achieve universal access and modern cooking fuels by 2030
- Continued support to Lighting Africa, which has reached nearly 7 million people in Sub-Saharan Africa with clean and improved lighting products
- International Electrotechnical Commission (IEC) adoption of Lighting Africa technical specifications as the world standard for clean, off-grid lighting products
- Launch of the Africa Clean Cooking Energy Solutions (ACCES) initiative and the undertaking of market and consumer assessments for scaling up cookstove adoption in the DRC, Senegal, and Uganda
- With the World Bank's Sustainable Energy Department and the IEA, co-authoring the *Global Tracking Framework* report, which sets the global baseline for universal energy access as well as the other two Sustainable Energy for All goals

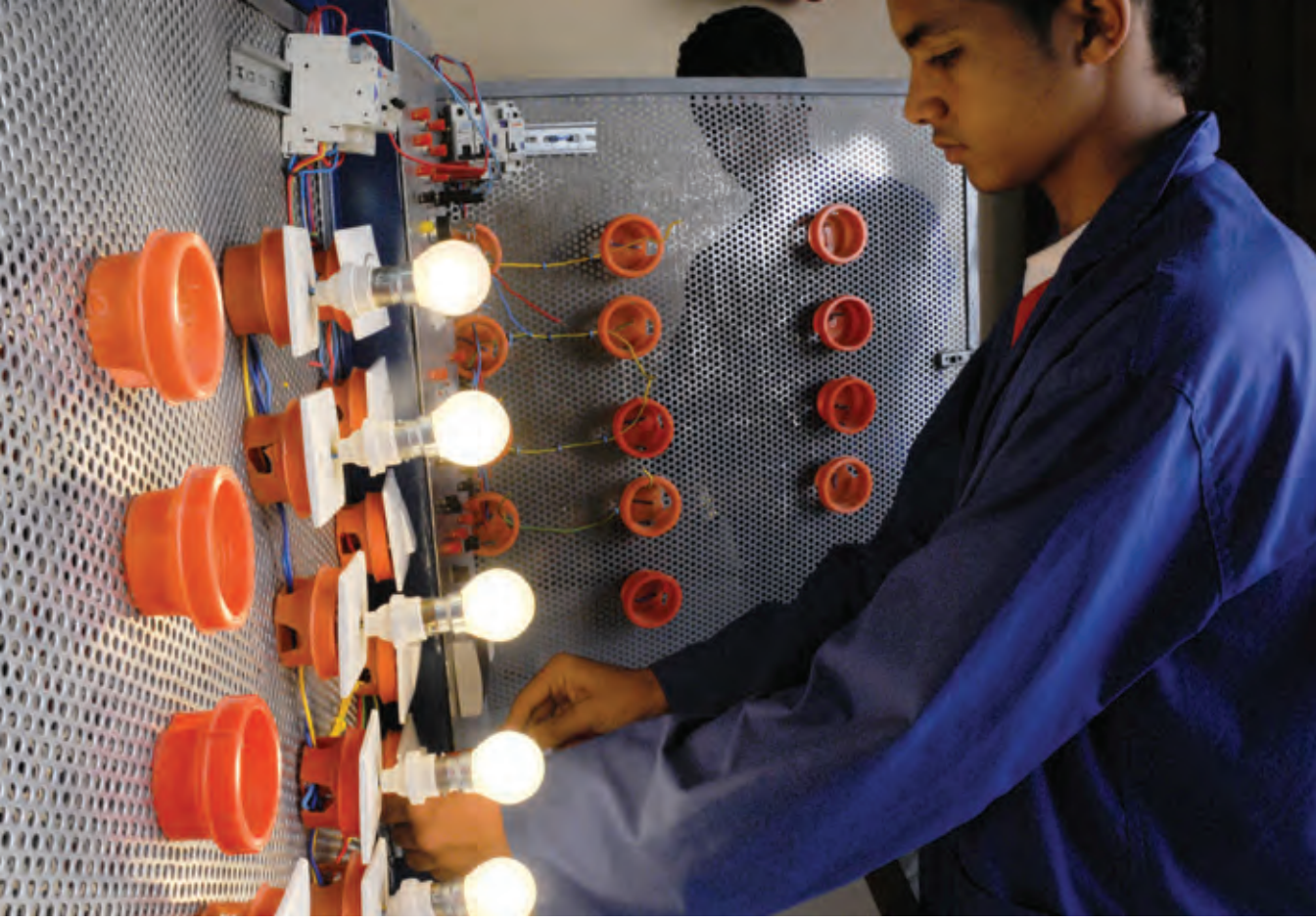
[4] See ESMAP 2012 Annual Report.
[5] See *Global Tracking Framework*, Box 1.3.

mobilizing donor resources for the proposals under the prospectus. The program is eventually expected to include more countries, with discussions currently underway with Nepal and Myanmar, as well as with countries in Central America.

Other activities in this area include a stocktaking of current energy access and clean cooking programs, institutional and human capacity development, and policy and regulatory advice. Another component is an in-depth study of the regional power trade in Africa, which assesses the state of physical infrastructure used in existing power pools, reviews the benefits of power pools, and maps priority projects. This activity will help to position the importance of regional power integration in high level dialogues on energy, including through SE4ALL.

A related activity is a global study to define and measure access to energy. Energy needs are multi-dimensional—they span household electricity applications, cooking/heating applications, productive applications, community energy needs and transportation. Binary definitions ("having a connection" or "not having a connection") fail to capture important differences in quality and quantity of access to energy.

This study has used a multi-tier framework to measure access to household electricity and modern cooking solutions, which were then included in the SE4ALL *Global Tracking Framework* published in May 2013. Comprehensive metrics have also been devised for both electricity supply and electricity services, while maintaining a technology-neutral approach. This work has achieved



wide consensus among a number of development institutions, and similar frameworks for measuring energy access for productive and community uses are under way. A report on energy access for health facilities is being produced in partnership with the WHO.

## Expanding Access to Clean, Affordable Cooking Solutions

A 2012 Global Burden of Disease Study, led by the WHO, estimates that household air pollution from cooking stoves is the fourth largest health risk in developing countries, claiming an estimated 4 million lives—predominantly women and children—every year. In FY2013, ESMAP intensified its activities in support of expanding access to clean and improved cooking solutions.

ESMAP supported a Global Clean Cooking Forum in Cambodia in March 2013, organized by GACC, that brought together over 500 different stakeholders in the cooking sector. ESMAP also worked with GACC on the first major study to map the global clean cooking sector. As well as looking at market size, the study also sets out standards for improved cookstoves along three axes: efficiency, affordability, and health impacts. The resulting report is expected to be released in early 2014.

Another ESMAP study explored the low rate of clean cookstove adoption in Central America, where fewer than 10 percent of the region's 20 million biomass users have access to safe, efficient cooking methods. *What Have We Learned about Household Biomass Cooking in Central America?* looks at a range of measures to expand clean cookstove use in the region.

The report points out that a large-scale, regional clean cooking program requires an enabling

environment that oversees and coordinates energy, health, environment, and gender issues related to household biomass use.

Key recommendations included removing market barriers, integrating social and cultural characteristics in cookstove design and dissemination, developing regional testing and quality standards for cookstoves, introducing innovative financing mechanisms, and launching country-based awareness campaigns informing end-users of the benefits of clean cooking. This work directly led to the formation of a regional initiative—to be supported by ESMAP's **SE4ALL Technical Assistance Program**—to help expand improved cookstoves programs in Central America.

### Integrating Gender into Energy Programs

In FY2013, ESMAP's **Gender and Energy program** continued to pilot programs designed to help women receive the full social and economic benefits of energy sector development. Initiatives that boost domestic energy access, modernize cook stoves, install public lighting and electrify public health centers have helped women in a number of countries enjoy improved quality of life and better income generating opportunities.

To help energy practitioners design projects that deliver equal benefits for women and men, the program developed a *Briefing Note on Integrating Gender Considerations into Energy Operations*, which discusses the key elements of the gender-energy topic and provides examples of how gender considerations have been successfully incorporated into the design and execution of World Bank energy programs.

The briefing note is complemented by an *Online Compendium of Gender & Energy Resources* that provides a range of basic tools to be used by energy practitioners in the design of energy projects. The tools focus on four areas: gender assessment; gender action plans; implementation and monitoring; and completion and evaluation. The online tools include sample questionnaires, checklists, and sample terms of references which can be downloaded for use by energy project teams. To help develop these resources and engage with operational teams, ESMAP facilitated various knowledge exchange activities across regions in both the energy and social development sectors.

### Business Models for Reaching the Urban Poor

The United Nations forecasts that the world's urban population will increase to 64 percent by 2050, with 94 percent of that increase occurring in developing countries. Though such rapid urbanization brings higher densities and shorter distances to service networks, developing world's cities have experienced increased inequality in

service provision. Today, about 1 billion people live in urban slums and informal settlements characterized by no or poor access to basic services such as water, sanitation, and electricity. Common barriers facing the urban poor in achieving access include high cost of service, inadequate infrastructure, and the uncertain legal tenure of slum dwellers and consequent lack of interest on the part of service providers.

ESMAP in FY2013 continued working with the Cities Alliance (CA), a global coalition focused on reducing urban poverty, to help slum communities gain full access to modern energy by 2030. ESMAP developed an *Action Plan for Energy Access and Efficiency for the Urban Poor*, which lays out a strategy, desired outcomes, and near- and medium-term targets. The program aims to make energy interventions an integral component of the urban development planning process, particularly as it relates to peri-urban areas, and to motivate energy suppliers to better serve informal communities.

## Africa Renewable Energy and Access Program

Now in its fifth year, the Africa Renewable Energy and Access program (AFREA) continues to help Sub-Saharan African countries expand access to reliable and affordable modern energy services. Established in 2008 with a $28.9 million contribution from the Netherlands, the program develops scalable and innovative solutions to close the region's energy gap.

In FY2013, AFREA executed a wide range of successful initiatives that helped meet energy needs and widen access; promote low carbon growth development and energy efficiency; and enhance

the capacity of key institutions such as government ministries, rural energy agencies, power utilities, regulators, and power pool operators.

AFREA finances a range of World Bank- and client-executed activities. Examples include Sector-Wide Approaches (SWAps) that have successfully expanded energy access in Kenya and Rwanda, and client-executed projects, such as the rehabilitation of a micro-hydropower plant in Liberia, where the ESMAP-supported initiative is developing institutional and human capacity as well as extending the benefits of electrification.

### Lighting Africa

**Lighting Africa**, a joint initiative of the World Bank and the IFC, continues to catalyze the development of sustainable markets for affordable and modern off-grid lighting solutions across Sub-Saharan Africa. In FY2013, the program expanded beyond its original Kenya and Ghana pilots to include Burkina Faso, the Democratic Republic of Congo (DRC), Nigeria, Senegal, and South Sudan, enabling low-income households and micro-enterprises to take advantage of high-quality alternatives to fossil fuel-based lighting.

In April 2013, the International Electrotechnical Commission (IEC) adopted Lighting Africa's quality assurance framework for solar LED lighting devices as a global industry standard (see Box 3.1). The Third Lighting Africa Conference took place in Dakar, Senegal in November 2012, attracting more than 300 off-grid lighting stakeholders and 40 exhibitors who shared the most recent market and technology trends and showcased new products, services, and cutting-edge technologies.

Since its inception in 2007, Lighting Africa products have reached nearly 7 million people—an achievement far surpassing the program's initial goal of reaching 2.5 million beneficiaries by 2012. To date, 49 products have met or surpassed Lighting Africa's quality and performance standards, with more than 1.3 million sold in 20 African countries.

Lighting Africa's business support services—which include access to financing, product research and development, and assistance in making contact with potential business partners—have benefited to date more than 1,900 companies and 2,500 individuals, while awareness campaigns educating consumers about the benefits of solar products have reached more than 22 million people at 1,500 village forums. In addition, the Lighting Africa team has engaged with client governments in 12 countries to discuss options to help catalyze local markets for small photovoltaic systems.

The Lighting Africa model has now been incorporated into a number of World Bank operations. In Ethiopia, the Electricity Network Reinforcement and Expansion Project has set aside $40 million to enhance the market for renewable energy. To date, $9 million of loan applications have been approved for importers of Lighting Africa-approved products. In Burkina Faso, the Electricity Sector Support Project has earmarked $1.5 million to finance a consumer awareness campaign and the deployment of lantern libraries in schools for the purpose of catalyzing commercial demand for Lighting Africa-approved products.

As the program expands and is further mainstreamed into World Bank lending operations, Lighting Africa is on track to meet its target of supporting the private sector to supply 250 million people in Africa with better lighting products by 2030.

### Biomass Energy Initiative for Africa

The nine pilot programs of the **Biomass Energy Initiative for Africa** (BEIA) concluded with positive outcomes at the end of FY2013. Since 2009, BEIA has provided grant funding to NGOs, research and private sector organizations to support innovation and develop scalable models for cookstoves, biofuels, and bioelectricity. BEIA incorporates sustainability of supply into all points

BOX 3.1

### LIGHTING AFRICA QUALITY ASSURANCE FRAMEWORK ADOPTED AS GLOBAL STANDARD

In April 2013, Lighting Africa celebrated the fact that the IEC had adopted its quality assurance specifications as the global standard for clean, off-grid lighting products. The IEC approval of the Lighting Global Quality Test Method (LG-QTM) helps harmonize quality assurance systems across different organizations and continents, thereby eliminating the need to conduct separate tests each time a product is introduced in a new country. This results in savings that can be transferred to buyers through lower priced quality goods.

The LG-QTM quality assurance standard was developed in partnership with Germany's Fraunhofer Institute for Solar Energy Systems and has since been updated and revised—following extensive stakeholder consultation in 2012—in a process managed by the Schatz Energy Research Center at Humboldt State University of the United States.

In 2007, at Lighting Africa's inception, there were no quality-certified off-grid lighting products on the African market and no affordable test methods to certify performance. The LG-QTM has since become the cornerstone of Lighting Africa and now serves as a quality benchmark for manufacturers to attain when making solar products—and for consumers to look for when buying them.

Dr. Michael Gatari, a professor who runs Lighting Africa's quality assurance laboratory at the University of Nairobi in Kenya, estimated that 70 percent of the solar lamps currently on sale in Sub-Saharan Africa are sub-standard, with common shortcomings such as fragility, rapid loss of brightness, and short battery life.

"The people with the greatest need for reliable, off-grid lighting are the ones hit hardest by faulty products that come with inflated claims," Dr. Gatari said. "The new IEC standard will help provide these consumers with more choices for modern, quality off-grid products."

of the biomass value chain, including through reforestation activities and sustainable charcoal production.

In Gambia, South Africa, and Uganda, project work in FY2013 helped develop sustainable businesses and stimulate a market for high-performance modern cookers and briquettes. In South Africa, a project to create a thriving market for efficient biomass stoves resulted in the sale of 8,000 stoves and 4,000 energy efficient products.

In Rwanda and Tanzania, BEIA schemes helped modernize the charcoal industry. A project in Tanzania enabled 720 people in 12 villages to be trained in producing charcoal from agricultural waste, while a program in Rwanda helped a cooperative improve its charcoal kilns. Projects in Benin, Ethiopia, and Kenya each helped demonstrate the feasibility of small-scale locally produced and consumed biofuels. In Kenya, a pilot scheme to scale up biodiesel production boosted daily output from 300 liters to more than 1,000 liters. And

in Mozambique and Uganda, BEIA initiatives helped increase power generation capacity for fish supply-chain refrigeration through the promotion of off-grid biomass gasification and biogas.

The majority of BEIA projects showed a strong potential for replication and scale up, with five of the nine initiatives securing additional funding from different donors for scale up activities. Over the course of its initial project cycle, BEIA has made great strides in changing peoples' attitudes towards biomass energy. As a means of symbolizing this shift, the heads of state of Tanzania and Uganda both purchased BEIA stoves and briquettes at public shows.

### Africa Clean Cooking Energy Solutions

After conducting a year-long consultation process involving more 130 stakeholders representing government, NGOs, the private sector and donors, the **Africa Clean Cooking Energy Solutions (ACCES)** initiative was officially launched in Dakar, Senegal, in November 2012. The program has since begun operations in the DRC, Senegal, and Uganda.

ACCES aims to improve the availability of clean cooking solutions and make biomass use and supply more sustainable in a region where some 700 million people are dependent on solid fuels such as charcoal, fuelwood, dung, crop waste, and biomass—most of which are burned in open fires or poorly designed cookstoves. Women and girls, who have the primary responsibility for cooking, spend hours each week collecting fuelwood. This translates into lost opportunities for increasing income, gaining education, and makes them subject to safety and security hazards.

Building on the Lighting Africa and BEIA market-transformation models, ACCES is designing a blend of World Bank- and client-executed activities to promote new technologies, provide business development support, remove market barriers, and catalyze the development of a sustainable market.

ACCES is currently conducting a series of analyses in the DRC, Senegal, and Uganda as part of a country-specific project design process. In the DRC, an ongoing research study is analyzing consumer preferences and strategies for scaling up

adoption; in Senegal, a team is conducting a market and value chain assessment; and in Uganda, an analysis of market barriers and a study of consumer willingness-to-pay are underway.

Also following on the Lighting Africa model, ACCES has initiated development of a regional quality assurance and technical support system to create performance standards for clean cookstoves.

**Africa Electrification Initiative**

The **Africa Electrification Initiative (AEI)** continues to support a network of energy practitioners committed to designing and implementing on- and off-grid electrification programs across Africa. The knowledge exchange and capacity building initiative has now established itself as the leading network of electrification practitioners in Africa. Since its first meeting in Mozam-

BOX 3.2

### NEW GENDER STRATEGY HELPS TANZANIA RURAL ENERGY AGENCY BRING ENERGY BENEFITS TO WOMEN AND MEN

In rural Tanzania, access to energy services has steadily increased over the past five years, leading to changes in community life. Women, in particular, have benefitted from these changes. As well as opening up opportunities for entrepreneurship, daily life has become easier. A recent field survey in Tanzania showed that the increased availability of energy had improved local infrastructure so that women did not have to commute as far—or wait in line as long—for basic services.

Facilitating access to modern, efficient and reliable energy sources in rural areas in Tanzania has been the work of the country's Rural Energy Agency (REA). Since its inception in 2007, the REA has supported a number of projects targeted at women, including dissemination of energy efficient stoves, promotion of more efficient alternatives to charcoal such as briquettes and pellets, and training on the development and use of biogas.

Despite these programs, the REA has lacked a clear 'gender roadmap' to help it systematically understand the different needs of women and men when it comes to energy use and access, and to evaluate how energy services were impacting men and women differently. Although the REA's work was having an impact on the lives of women, a lack of baseline information disaggregated by gender meant it was difficult for the agency to fully measure the effectiveness and impact of its interventions.

In response, the World Bank has worked with the REA to develop a strategic gender action plan. The initiative is supported by ESMAP through AFREA, and draws directly on the resources that ESMAP has developed to help integrate gender into energy projects. The objective of the program is to increase awareness and capacity to understand and address gender in rural energy projects, to ensure that REA's work benefits both men and women.

*(continues on next page)*

bique in 2009, the AEI has brought together—at knowledge sharing events and through an online platform—over 230 representatives from African energy ministries, utilities, regulatory entities, research centers, women's groups, and NGOs to share practical information on the design and implementation of electrification programs.

In FY2013, the AEI completed work on two publications focusing on access issues. *Connection Charges and Access to Electricity in Sub-Saharan Africa* explores how to improve electrification rates by addressing the region's high connection charges. *From The Bottom Up: How Small Power Producers Can Deliver Electrification and Renewable Energy in Africa* outlines strategies to create

BOX 3.2 (*continued*)

"Our agency is committed to making gender considerations an integral part of everything we do," said Lutengano U.A. Mwakahesya, Director General of the REA. "This allows us to benefit from a diversity of experience, and to fully maximize the benefits of our human resource base."

As part of this initiative, the agency conducted a baseline assessment of how gender was understood and mainstreamed into monitoring and evaluation, training, and operations within the organization itself, as well as an audit of how well gender considerations had been integrated into existing projects. This resulted in the development of a gender strategy for the organization, as well as tools—including indicators, checklists, and guidelines—for integration of gender into programs. This is similar to work ESMAP has supported in other countries in Africa, including Senegal, Mali, Kenya, and Benin.

The gender strategy grew out of, and is linked to the REA's overall Strategic Plan and defines the overall gender goal and specific objectives to be achieved. These include creation of a gender unit, integration of gender indicators in all reference documents and recruitment processes, and development of a gender disaggregated database. Training has been developed and workshops have been held for REA staff to help strengthen their skills in integrating gender considerations into energy project development, implementation and evaluation. The training also reviews recent best practices in integrating gender considerations into energy programs and projects from other countries.

"Energy issues, particularly in rural areas, are by and large issues [that impact] women and girls, in terms of the time and labor spent on either collecting fuel wood, cooking using dirty energy sources or walking miles to fetch water due to a lack of water pumps," said Musa Muze, Legal Affairs Manager for the REA. "However it is mostly men who still dominate decision making and planning about energy in both rural and urban settings. Training energy practitioners on how and why to integrate gender is critical."

commercially viable small power-producing businesses in rural areas that will in turn invest in and operate renewable and hybrid generators or cogenerators to produce grid electricity.

The AEI is also preparing a low-cost electrification technical assistance project in cooperation with the EU Energy Initiative Partnership Dialogue Facility (EUEI PDF). This project takes stock of the various energy challenges facing different countries, and is also planning a third AEI workshop for Sub-Saharan energy practitioners to be held in Tanzania in late 2013.

### AFREA Gender and Energy Program

AFREA's cross-cutting **Gender and Energy Program** improves the participation of women in energy sector planning to ensure a more equitable sharing of the benefits of expanded access. For example, by addressing obstacles and formulating appropriate incentives, the program helps women achieve greater gender parity in the planning and operation of rural electrification projects. This ensures that issues that disproportionately affect women—such as refrigeration, domestic chores (fuel/water collection), barriers to new technology, and access to credit—are considered as an integral part of the project design process.

In FY2013, Gender and Energy Program activities were implemented in Benin, Kenya, Mali, Senegal, and Tanzania, with the objective of creating conditions for women to enjoy the same benefits from energy sector development as men. In each country, AFREA has linked global and local gender experts with energy sector practitioners responsible for designing and implementing new programs.

One example of how gender mainstreaming is moving from advocacy to action can be found in Senegal, where an implementation team that includes a community organization, gender experts, and female staff members has ensured gender parity in local management committees and energy projects and has helped women profit from participation in a charcoal value chain from which they had previously been largely excluded.

In Benin, an ESMAP-funded gender study has contributed to increased income for more women in village associations supported by the World Bank's Increased Access to Modern Energy Project. Education campaigns conducted in participating villages as part of the gender study has enabled the inclusion of more women in village associations: the share of women participating has increased from 11.6 percent to 37.5 percent. In Tanzania and Mali, the local rural energy agencies have integrated gender into their business models and appointed gender focal points (see Box 3.2).

In FY2013, the experiences from the AFREA Gender and Energy Program have been key inputs to various knowledge exchange activities across ESMAP and the World Bank. In addition, gender and energy sessions have been organized during AFREA program events such as AEI workshops and ACCES consultations.

## FY2014 AND BEYOND: NEW INITIATIVES

During FY2014, ESMAP's Energy Access program will continue its efforts to expand modern, sustainable energy services by helping to improve

BOX 3.3

## HIGHLIGHTS OF NEW ESMAP-SUPPORTED ENERGY ACCESS ACTIVITIES BY THE WORLD BANK'S REGIONAL UNITS

### DEVELOPMENT OF A RURAL ELECTRIFICATION STRATEGY IN PAPUA NEW GUINEA

Access to electricity in Papua New Guinea is essentially limited to major urban areas, while 87 percent of the total population lives in rural areas with very limited access to electricity. The Government of Papua New Guinea has requested World Bank support in developing a strategy that will consider the best available rural electrification options for each province. The ESMAP-funded activity will support formation of an Electrification Roll-Out Plan to complement the World Bank's proposed Energy Sector Development Project. The World Bank team will provide technical advice to the government on how to integrate the findings of this work with ongoing policy objectives, and facilitate discussion between national energy stakeholders and counterparts from other countries and financing organizations.

### SUPPORT TO PERU'S SECOND RURAL ELECTRIFICATION PROJECT

The lack of electricity and other infrastructure in Peru's rural areas has resulted in diminished quality of life, poor medical care and education, and limited opportunities for economic development. The World Bank's Country Partnership Strategy with Peru supports the country's efforts to increase economic growth and make headway in the fight against poverty. An ESMAP-funded SME development program will support the government's Second Rural Electrification Project that aims to increase the national electrification rate to 88 percent by 2020. This will be achieved by building on the lessons learned in a pilot project supported by ESMAP in 2011–12 that encouraged individuals and businesses in rural Peru to put newly available electricity to productive use (see ESMAP 2012 Annual Report, Box 3.2). The objective of this second-stage project is to make promotion of productive uses an integral part of the activities of the General Directorate of Rural Electrification.

regulatory and policy frameworks; building the capacities of energy institutions; and dissemination of global best practices.

In line with its current Business Plan, ESMAP will direct its focus at four key areas:

**Supporting global SE4ALL objectives**: ESMAP will continue to help countries work toward attainment of the SE4ALL objectives, particularly in regard to achieving universal access to modern energy and clean cooking solutions by 2030. The cornerstone of this effort will be the SE4ALL Technical Assistance Program, which is expected to expand to regions beyond Sub-Saharan Africa starting in FY2014 (see above).

Following the development of multi-tier frameworks for measuring energy access presented in the SE4ALL *Global Tracking Framework*, a follow-on activity will be launched to support the implementation of multi-tier metrics to track progress towards the goal of universal access to energy by 2030, through technical assistance for

pilot implementation of household energy surveys across select countries with a number of development partners. Comprehensive questionnaires will also be made available to assess the socio-economic linkages of energy availability and poverty (including gender-specific impacts), and establish the access impact of various energy projects.

**Extending energy access to poor communities in urban and peri-urban areas**: ESMAP will continue to work with the CA to bring modern energy services to the urban and peri-urban poor. Support will be provided to country-level programs with the potential to increase electricity and clean cooking access in peri-urban areas and informal settlements. These programs will include short studies to better understand the state of energy access in these communities, and CA-supported training on sustainable and inclusive urban development for city authorities.

A South-South knowledge exchange component, including study tours and expert visits, will enable selected country practitioners to learn from the successful practices from other countries.

To better inform future efforts to provide legal, safe and affordable electricity to the urban poor, this work will also include a study to uncover factors that contribute to successful interventions in this area. The study will analyze selected cases to draw conclusions on key regulatory, policy, and implementation factors that influence success and guide decision-making by power utilities, regulators, and government authorities.

**Enhancing support to Africa through the AFREA program**: AFREA II will strengthen the focus on

the energy access and renewable energy challenges faced by Sub-Saharan Africa. By building on the experiences of AFREA I, the insights of staff actively working in the field, the lessons learned in past operation, and the pressing issues facing clients, AFREA II seeks to place itself at the strategic center of the World Bank's support to all renewable energy and energy access challenges facing the Africa region.

AFREA II's programmatic approach will build upon four pillars:

i. strengthening investments;
ii. establishing clearer effective policies and more effective institutions;
iii. enhancing the role of markets; and
iv. generating knowledge and building capacity.

These pillars will be informed and strengthened by a cross-cutting focus on (a) making Bank-supported energy operations gender-informed and (b) supporting the special needs of post-conflict and fragile states.

**Preparing a State of Energy Access Report**: Drawing on its analytical and knowledge base, ESMAP will produce a comprehensive report on the state of global energy access. Using a format similar to the World Bank's *World Development Report*, the *State of Energy Access Report* will present a detailed qualitative and quantitative assessment of different energy access interventions around the world. The report will complement the *Global Tracking Framework*'s methodology for tracking progress towards achieving universal energy access by providing a comprehensive review of access efforts and achievements. The inaugural report is expected in late 2014.

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CHAPTER 4

# FOSTERING SUSTAINABLE, ENERGY EFFICIENT CITIES

Cities in the developing world continue to grow by leaps and bounds. Although associated services, including transport, water, and energy systems, are being built out at a pace that would have been unimaginable even a couple of decades ago, developing country cities are still struggling to keep up with demand. As the largest units of consumption of energy, and the home to a majority of the world's population, cities are where efforts to create a sustainable energy future will succeed or fail.

Cities present some of the best low-cost opportunities for energy savings. And by integrating energy efficiency into urban planning and the development of municipal services, cities can avoid becoming locked into inefficient and high carbon growth patterns.

Since 2009, ESMAP's **Energy Efficient Cities Initiative** (EECI) has worked closely with city governments to help them understand their energy efficiency options and learn from the experience of other cities. It has also developed tools and case studies for use by municipal administrators, and served as

knowledge clearinghouse for best practices on energy efficient urban development. ESMAP's work in this area is based on the premise that urban systems, such as water, transport, and buildings, do not function in isolation and must be addressed in an integrated manner.

## FY2013: HIGHLIGHTS AND ACHIEVEMENTS

### TRACE Goes Global

Urban energy efficiency is a growing part of the World Bank's portfolio. Increasingly, this work is informed by the ESMAP-developed **Tool for Rapid Assessment of City Energy (TRACE)**. TRACE allows cities to quickly identify potential energy efficiency improvements, target underperforming sectors, and prioritize interventions. Performance is benchmarked against peer cities using a database of 28 key performance indicators collected from 93 cities around the world.

As of the end of FY2013, TRACE had been deployed in 25 cities (up from 11 a year earlier), and had extended its reach beyond Asia and Eastern Europe to Africa and Latin America. Among the recent deployments were Accra, Nairobi, Bogota, and Rio de Janeiro.

EECI has catalyzed a number of World Bank country programs in urban energy efficiency. In Romania, a World Bank team is deploying TRACE in seven fast-growing cities to identify specific interventions to be financed under a regional development program funded by the European Union. In Turkey, TRACE findings have informed the World Bank's $300 million Sustainable Cities

### ACHIEVEMENTS IN FY2013 UNDER THE ENERGY EFFICIENT CITIES INITIATIVE

- Expansion of deployment of the TRACE tool from 11 cities in FY2012 to 25 cities in FY2013, to help major urban centers such as Accra, Nairobi, and Rio de Janeiro assess their options for improving energy efficiency
- Design of a new $12 million World Bank-GEF project, approved in April 2013, to promote improved building energy efficiency and "low carbon, adaptive and livable" urban spatial development in Chinese cities (see Box 4.2)
- Integration of the recommendations of ESMAP's FY2012 report on energy efficiency in municipal water and wastewater systems into a $42 million World Bank loan to Uruguay's national water utility, as well as a new multi-year Energy Management for Water Utilities Program developed by the Latin America region of the World Bank
- Support to the design and preparation of a $100 million World Bank loan for a low carbon city project in Shanghai that focuses primarily on commercial building energy efficiency
- Publication of the report *Public Procurement of Energy Efficient Products – Lessons from Around the World*, which demonstrates how governments can influence markets, improve sustainability and save money by adopting energy efficient procurement practices
- Continuation of the Leaders in Urban Transport Planning program—which develops leadership capabilities in urban mobility planning and management by taking into account issues such as land use and environmental protection

Project, which will help finance long-term infrastructure investments.

In Kenya, TRACE is being used to identify investments for a master energy efficiency plan for Nairobi. In Asia, TRACE assessments first developed in Vietnam have been used to create Sustainable Urban Energy Guidelines for World Bank-supported programs across the region. In Brazil, Rio de Janeiro is preparing specific interventions in its lighting and building sectors that were identified by TRACE as having the greatest energy-saving potential (see Box 4.1).

Customized versions of TRACE are being developed by other organizations—for example, by Lawrence Berkeley Laboratory for China (see Chapter 1) – that take into account national and local planning needs, indicators, and targets. At the same time, the tool is being taken up by organizations such as Iller Bank of Turkey and the EU Energy Initiative Partnership Dialogue Facility to support the cities where they work.

## Addressing the Complexity of Urban Transport

Making urban transport more efficient has the potential to not only substantially lower the energy consumption and GHG emissions of cities, but also improve the quality of life for residents. To address this, many cities are taking a more comprehensive approach to transport planning that goes beyond traditional issues, such as congestion management and development of public transit, to integrate urban spatial planning, land use, affordability issues, demand management, and environmental protection.

To support this new approach, the **Leaders in Urban Transport Program** has organized a series of training events around the world to develop client capabilities in urban mobility planning and management. The program was developed by the World Bank's Transport Anchor, and supported by ESMAP, the Australian Agency for International Development (AusAID), AFD, the Public-Private

Infrastructure Advisory Facility (PPIAF), and other partners.

The program comprises two phases: a self-learning phase during which participants study materials covering transport planning and associated issues such as land use; and a seven-day face-to-face workshop in which participants diagnose the key problems experienced by cities and look in-depth at financing, governance, environmental, and social issues.

The first workshop was held in Singapore in January 2012, and was followed by events in Fuzhou, China, and Marseille, France. In FY2013, training events were held in Ahmedabad, India; Buenos Aires, Argentina; Beijing, China; Seoul, Republic of Korea; and Mexico City, Mexico. A second round of workshops was held during the same period in Singapore and Marseille.

As of June 2013, 236 leaders in urban transport from 30 countries had taken the training, with most participants representing senior levels of their municipalities' transport agencies.

## Spreading the Word on Energy Efficient Procurement

Countries increasingly see the public procurement of energy efficient goods and services as an opportunity to influence markets and create consistent demand for emerging technologies. While energy efficient purchasing is well established in many developed countries, the practice is growing rapidly as many low- and middle-income countries recognize the benefits of resource efficiency.

A major report—***Public Procurement of Energy Efficient Products: Lessons from Around the World***—published in October 2012, continues ESMAP's work in this area. The report demonstrates how taking energy efficiency into account helps governments achieve one of public procurement's primary objectives: getting the best value for their money. While some efficient equipment requires slightly higher investment than their less-efficient counterparts, the reduction in energy expenses and in many cases, longer product lifetimes, make them more cost-effective in the long run. In addition, such policies and programs allow governments to lead by example, and their purchasing power can help bring new suppliers into local markets while increased competition can help drive down product prices.

The report also details a range of energy efficient procurement program models available to governments, including product labeling, publishing a catalog of technical specifications, life-cycle costing, and preferential treatment in procurement. The direct benefits can be substantial. In just one example, a green purchasing initiative established in Mexico City in 2011 has offset the annual equivalent of 340 GWh of power generation.

BOX 4.1

## BRAZIL: RIO USES TRACE TO BOOST ENERGY EFFICIENCY AT COMING GAMES AND BEYOND

Rio de Janeiro is busy with preparations to host the FIFA World Cup in 2014 and the Summer Olympic Games in 2016. Among the world's most storied cities, Rio has made a firm commitment to clean energy and energy efficiency. The city's managers are working to make the World Cup and the Summer Olympics the most energy efficient ever.

Since late 2012, Rio officials have partnered with the World Bank to analyze their options using the ESMAP-developed TRACE tool, which helps city planners identify and choose among energy efficiency opportunities. The analysis was completed in mid-2013.

The TRACE deployment supports the Rio de Janeiro Low Carbon City Development Program, a pioneering climate change mitigation initiative launched by city officials and the World Bank's Latin America Region at the 2012 Rio+20 Summit. Under the program, Rio de Janeiro has voluntarily committed to reduce its GHG emissions by 20 percent from its 2005 levels by 2020.

"Now is a time to re-invent the city and pursue a low carbon view of the future," said Rodrigo Rosa, Special Advisor to the Mayor of Rio de Janeiro. "We expect that TRACE, as part of the Rio Low Carbon City Development Program, will help us to push this vision forward."

Based on the outcome of the TRACE study, Rio identified two potential promising investments in energy efficiency: public street lighting using LEDs and energy efficiency retrofits in municipal buildings. Realizing the energy efficiency potential in these sectors would enable Rio to realize fiscal, energy and GHG emission savings.

In May 2013, Rio asked the World Bank to embark on a detailed feasibility study that will provide implementation and financing options for these two projects. These studies—partially funded by ESMAP—are intended to explore a broad spectrum of financing options, from municipal budget transfers to municipal borrowing to PPPs. The World Bank is exploring financing mechanisms that will allow Rio and other cities in Brazil to bundle energy efficiency investments in order to reduce transaction costs and achieve scale.

In early 2012, the Brazilian city of Belo Horizonte became the first in Latin America to implement TRACE. The ESMAP team's TRACE assessment resulted in actions in the transport sector, including the adoption of traffic flow optimization measures.

The TRACE process is usually conducted over three months. Experts collect data, make onsite assessments, interview local decision-makers, and prepare a comprehensive report recommending interventions to improve energy efficiency.

BOX 4.2

## CHINA: INTEGRATING ENERGY EFFICIENCY INTO BUILDINGS AND URBAN SPATIAL PLANNING

Between 1990 and 2010, China's urban population more than doubled and its urban building stock more than tripled. By 2030, it is estimated that China will have more than 1 billion people living in cities. Most of these newly developed urban areas, while providing citizens with modern amenities and expanded living space, have lost the livability of the old quarters of Chinese cities where residents can access essential services by walking or biking.

The Chinese Government has pledged to reduce the economy's carbon intensity by 40 to 45 percent by 2020 compared to 2005, and the Ministry of Housing and Urban and Rural Development (MOHURD) has been promoting low carbon cities since 2007. To date, over 200 Chinese cities have included low carbon growth in their development objectives. However, the growth of green buildings in cities is impeded by a lack of effective policy implementation, and little is known about the energy performance of existing public and commercial buildings. Prevailing planning standards lack clear guidance for the development of compact urban forms that promote walking and make efficient use of transit systems.

A new $12 million World Bank-GEF project—Urban Scale Building Energy Efficiency and Renewable Energy—seeks to address these and other constraints. To this end, the World Bank and GEF are partnering with MOHURD and the Beijing and Ningbo municipalities to promote sustainable urban spatial planning and accelerate the adoption of energy efficiency and renewable energy in urban areas.

This project was informed in part by the ESMAP-supported study *Low Carbon City Development in China*, published by the World Bank's East Asia regional unit in FY2012. Design of the project was led by ESMAP, drawing on lessons learned from EECI on how urban spatial planning can reduce the overall energy consumption of cities. The ESMAP support was founded on the principle that effective programs of this sort must integrate interventions at both the macro level (urban spatial planning) and the micro level (building codes and retrofits).

The project, which was approved by the World Bank in April 2013, will help MOHURD improve key statutory urban planning standards and regulations and develop a new energy performance benchmarking system for buildings. Another component will help scale up commercially viable rooftop solar photovoltaic installments, which will produce energy to be sold back into the grid in Beijing and other cities.

The overall objective of the project is to help improve the sustainability of new construction in selected Chinese cities, and to develop a methodology that MOHURD could then disseminate at the national level. The project's aim is not only to improve the energy efficiency of public and commercial buildings, but also help develop effective policies for the promotion of low carbon, adaptive, and livable urban forms in China.

The report has been disseminated through the Responsible Purchasing Network and the Super-efficient Equipment and Appliance Deployment working group, as well as through regional workshops in Eastern Europe, where World Bank engagement with clients on energy efficiency is growing rapidly. It has also served as a background report for the World Bank's own procurement reforms.

### Putting Energy Efficiency into Practice in Water Utilities

The findings of another major ESMAP report published in FY2012—***A Primer on Energy Efficiency for Municipal Water and Wastewater Utilities***—are now being taken up by countries and integrated into World Bank operations. The report demonstrates that implementing energy efficiency measures at city water utilities in developing countries could lead to energy savings of 5 to 25 percent, help control costs, and expand water access to the poor.

In China, the report has been adopted by the Shanghai Municipal Investment Corporation as training material for the managers of its water and wastewater facilities as part of a World Bank-financed wastewater infrastructure project.

In Uruguay, the report has informed a $42 million World Bank loan to increase the sustainability of the national water utility, Obras Sanitarias del Estado (OSE). The loan will be used to improve the reliability and resilience of OSE's water supply and sanitation systems, make efficiency improvements, and strengthen management capability. The loan was signed in December 2012, and already OSE has applied the financing to the purchase of energy efficient motors for its plants, the development of an asset management program, and the creation of new measurement and control indicators.

The Latin America region of the World Bank has used the report's recommendations to develop a multi-year Energy Management for Water Utilities Program. Latin American countries are beginning to address the connection between water supply and energy, but financing and knowledge constraints have held back the development of energy practices within water utilities. Partially supported by ESMAP, the program will scale up energy management capacity at utilities around the region, building a knowledge base on energy issues for water practitioners.

## FY2014 AND BEYOND: NEW INITIATIVES

ESMAP's EECI is building on its previous successes—such as technical reports on procurement

BOX 4.3

## MEXICO CITY: OPEN DIGITAL DATABASE HELPS IMPROVE TRANSPORT EFFICIENCY

On any given day more than 32 million trips—nearly 20 million of them using public transport— are made in Mexico City. More than 60 percent of these take place within a complex maze of train, trolley, and bus routes that includes 12 subway lines, 94 bus lines, 4 metrobus routes, 8 trolleys, 1,400 minibus routes and 260 public bike stations.

For the past four decades, this uncharted network has been overseen by five separate transit agencies which fall under the umbrella of La Secretaría de Transportes y Vialidad (SETRAVI), Mexico City's public transit authority. And although each agency has made attempts to collect and store data on metrics such as passenger counts, route licenses, and stop locations, there has never been a concerted effort to assemble this disparate data in one place. This has limited SETRAVI's ability to plan and coordinate different modes of transport and inhibited public transport users from planning seamless multimodal trips.

In response, the World Bank's Latin America Region—with ESMAP support—in FY2013 worked to provide SETRAVI with technical assistance to develop a new digital platform that will assemble a comprehensive transport database in a single, standardized, and shareable format for the first time.

Representatives from each transit agency were enrolled by SETRAVI to crisscross the capital with mobile phones to collect real-time transit data such as route, speed, location of bus stops, and frequency of train departures. The collected data was then fed into a data management portal and converted into General Transit Feed Specification (GTFS), the de facto standard with which cities record transit data.

The GTFS standard was created in collaboration between Google and the US city of Portland, Oregon, in 2005. GTFS is easy to maintain and replicate and enables the collection, storage, publication, and updating of open data on transit routes, times, stops, and other information for all public transport systems.

Mexico City's compiled GTFS data has now been made publicly available to third-party developers to create computer applications such as trip planners and timetable publishers that can be used on smartphones and other devices. These programs will in turn serve a wide range of beneficial functions, such as helping commuters avoid long waits and make time saving connections at bus and train stops.

Urban planners in Mexico City now have comparable data and are able to access free open source software with open architecture that helps them visualize route configuration, determine where best to add or eliminate services, and regulate and optimize service provision. This will help decrease traffic congestion, reduce oversupply of empty buses, increase mobility, and reduce energy consumption and GHG emissions. Moreover, the new data is also helping raise awareness about public transportation and making the overall transit experience for users more reliable and attractive.

and water systems and development of the TRACE tool—to become the primary reference point within the WBG for urban energy efficiency. The focus going forward will be on finding synergies among different municipal sectors and helping cities overcome the barriers they face in implementing energy efficiency investments. A series of guidance notes targeted to city mayors will be published in FY2014 covering key urban efficiency issues including public procurement, transport, buildings, financing, urban planning, and energy efficiency assessments.

The most prominent energy efficiency initiative will be a multi-year program—led by ESMAP in conjunction with several World Bank departments and external partners—to transform city energy use by integrating energy efficiency into city planning, development, management, and strategy. The **City Energy Efficiency Transformation Initiative (CEETI)** will provide mayors' offices and urban planners with the necessary knowledge, tools, and technical assistance with which to implement energy efficiency measures that will improve public services, save money, and consume less energy.

The new initiative will provide training to senior officials nominated by mayors from participating cities in financing programs, assessing energy efficiency opportunities, and preparing comprehensive efficiency plans. This will be combined with support to cities in the development of urban energy efficiency investment projects and programs, and mobilizing finance for them. A global innovation competition to identify information communication technology solutions for urban energy efficiency challenges is also envisaged.

ESMAP has established two major grants to support the development of energy efficiency measures in urban transport and water and sanitation sectors. A $700,000 Energy Efficient Urban Transport grant will finance a wide range of initiatives, including schemes to reduce demand for motorized travel and to improve the energy efficiency of urban transport services. And ESMAP's $500,000 Energy-Efficient Urban Water and Sanitation Services grant will help cities reduce operating costs and improve utility-level energy management while addressing water conservation and managing water demand. After a World Bank-wide call for proposals, six transport and four water projects have been approved for grant funding in FY2014.

BOX 4.4

## HIGHLIGHTS OF NEW ESMAP-SUPPORTED ENERGY EFFICIENCY ACTIVITIES BY THE WORLD BANK'S REGIONAL UNITS

### SCALING UP ENERGY EFFICIENCY IN BUILDINGS IN THE WESTERN BALKANS

A 2010 ESMAP study estimated that implementing energy efficiency measures in the Western Balkans region could lead to $3.4 billion in energy cost savings and significantly reduce the need for costly energy imports. Since buildings account for nearly half of the energy consumed, they represent a prominent sector in many national energy efficiency strategies. This activity is building on the recent ESMAP-supported stock-taking exercise established to develop a roadmap for scaling-up energy efficiency in the region's building sector, with an emphasis on public and residential buildings. The analysis and resulting roadmap includes measures across five areas—legislation, policy and regulations, market conditions, financing and implementation, and capacity building—to identify gaps in order to develop national-level, scaled programs. It also identifies deficiencies within existing approaches, underserved market segments, potential financing and business models, and recommends strategies to address them. This is expected to lead to a series of investment programs in countries in the region, and lessons that will be of interest to the wider Europe and Central Asian region, as well as East Asia and other regions.

### TRACE MODEL IN PILOT CITIES IN LATIN AMERICA

This activity will use the TRACE tool to perform energy efficiency assessments in two Mexican cities (Puebla and Leon) and in Bogota, Colombia. The objective is to provide a framework to assess where

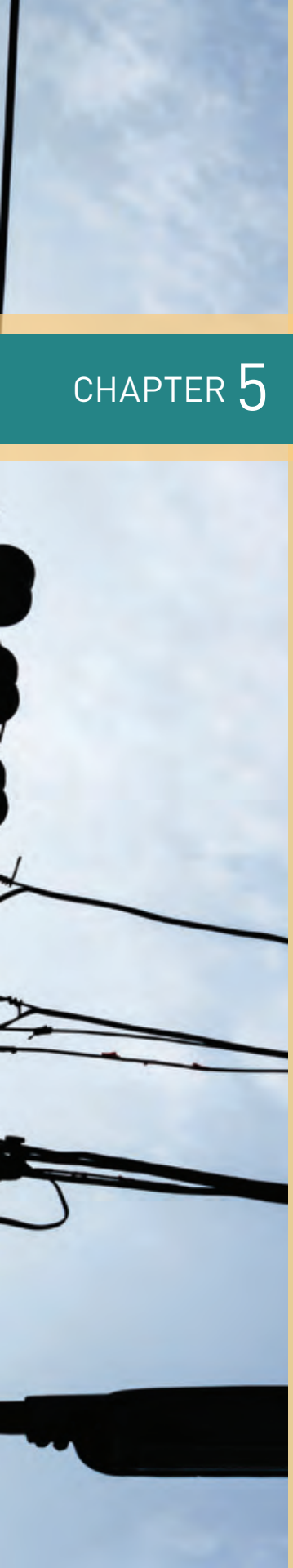
*(continues on next page)*

BOX 4.4 (*continued*)

efficiency gains are possible and which interventions will be most effective. This is expected to yield important results by helping municipal authorities identify high impact areas and investments. A final report will delineate the potential for energy efficiency improvements in selected municipalities in Latin America.

### CHINA: ISSUES AND OPTIONS IN MONITORING, VERIFICATION, AND REPORTING OF ENERGY EFFICIENCY

China is the world's largest energy consumer and the largest emitter of CO2. With a rising population, rapid urbanization and a fast-growing economy, China's future energy needs have raised serious technical challenges as well as concerns over energy resource adequacy. The objective of this technical assistance activity is to support the Chinese Government's efforts to identify key actions that will strengthen the measurement and verification system for energy efficiency. Outputs will include a review of international experience in energy monitoring and verification systems, including approaches and methodologies, cost implications, and institutional arrangements; and training to selected Chinese verification agencies about these international experiences. The activity is expected to contribute to the achievement of reductions in energy intensity through facilitating knowledge exchange, expanding the use of more reliable data, and improving the cost-effectiveness of government energy savings programs.



CHAPTER 5

# DEVELOPING EFFECTIVE ENERGY SECTOR POLICIES AND INSTITUTIONS

Developing countries are facing increasing pressures as they try to transition towards a more efficient, cleaner, and better-governed energy sector. High fossil fuel prices mean that countries need to review long-standing energy subsidy regimes. Energy production, transmission, and distribution systems must be expanded and upgraded to meet the needs of growing economies and burgeoning urban populations, and this will require credit-worthy utilities. In many cases, parts of the energy sector have been unbundled, competitive markets set up, and new regulatory bodies established. While many countries have initiated restructuring of their energy sectors, the job is far from complete.

ESMAP's Energy Assessments and Strategies Program is designed to help developing countries improve energy sector planning, policy making, and governance through direct technical assistance and targeted knowledge products. This was ESMAP's original mandate and has formed the bulk of

ESMAP's engagement with clients over the past 30 years. Analytical work has focused on improving energy sector institutions and regulatory frameworks, market development, private sector participation, and regional energy cooperation. In these areas, ESMAP continues to play a role in helping WBG clients make better-informed decisions in an ever-changing global landscape.

## FY2013: HIGHLIGHTS AND ACHIEVEMENTS

### META: Integrating Externalities into Electricity Supply Decisions

The **Model for Electricity Technology Assessment (META)** was developed by ESMAP in FY2011–12 to help energy policymakers and planners in evaluating the costs of more than 50 competing generation options ranging from solar, wind, and geothermal, to fossil fuel-based power. META is based on detailed analysis of the capital and operating costs of various technologies for three representative countries. One of the most prominent features of the model is that it integrates environmental externalities. This gives users a simple way to see the cost of adding or expanding generation from a particular power source if, for example, the carbon price is explicitly factored in.

META, while still in its pilot phase, has been rolled out to selected clients and partners. At the KTH Royal Institute of Technology in Sweden, META has been integrated into a course on energy systems analysis. At the Wharton School of Business in the United States, it was used to assess energy supply costs as part of a class on energy investments in developing countries.

### ACHIEVEMENTS IN FY2013 UNDER THE ENERGY ASSESSMENTS AND STRATEGIES PROGRAM

- Completion of the comprehensive *India Power Sector Diagnostic Review*, which makes a number of recommendations on how to strengthen the Indian power sector, including a synthesis report and background papers
- Work with clients and partners to disseminate the Model for Electric Technology Assessment (META), which has been used in electricity planning in Haiti and Jamaica, as well as by a number of universities
- Sector-wide technical assistance in the Philippines that led to changes in the country's electricity grid code which will make it easier to integrate variable renewable power sources into national grids
- Publication of new analytical work on open access to power grids that is expected to be widely used by World Bank clients as they introduce competition into their electricity sectors

META is being used to support government ministries in Haiti and Jamaica in assessing alternative generation technologies. In both cases, the current cost of electricity supply is analyzed and comparable renewable energy resource and fossil fuel options are considered. That country-specific data was combined with META analysis to determine the projected cost of electricity from various sources over time. These findings were then packaged into various scenarios, allowing

the ministries to make better-informed decisions about alternative generation technologies.

META can be used in conjunction with commonly used power system planning tools, by enabling preliminary technology screening and by providing detailed technical and cost breakdowns. Users can look at options categorized by scale: off-grid, mini-grid, and grid-connected.

Going forward, based on global user feedback, META will be further updated to bring in additional functionalities. META will also be rolled out as part of an ESMAP-supported open platform for low carbon development planning tools.

### Taking Stock of the Indian Power Sector

In FY2012–13, ESMAP supported a comprehensive study ***India Power Sector Diagnostic Review,*** which was undertaken by the South Asia Energy Unit of the World Bank. This review, carried out at the request of the Indian Ministry of Finance and the Planning Commission of India, assessed achievements since the passage of the Electricity Act of 2003 and identified remaining challenges. It builds on stand-alone background papers on five key priority topics identified by the Indian authorities: access to electricity, utility financial and operational performance, domestic tariff subsidies, corporate and regulatory governance, and private sector participation.

The review highlights the significant achievements of the sector in the last decade, particularly in terms of expanding energy access, increasing generation capacity and the share of renewables in the energy mix, and attracting private investment. Yet immense challenges remain. More than 300 million Indians continue to lack access to electricity, and an unreliable power supply is still a

major constraint to the country's aspirations for growth, inclusion, and job creation. The need for continued improvement of performance across all segments of the sector was highlighted in July 2012 when two massive grid failures interrupted power supply to the northern half of India for two days, affecting 600 million people.

Concerns about sector performance have their roots in the weakness of many sector institutions—particularly state-owned utilities, which have accumulated substantial operating losses and, in several cases, are insolvent, unable to pay bills or repay their debts.

The report makes a number of policy suggestions to strengthen the sector, including:

- Strengthening governance, including by professionalizing and empowering state utility boards and bringing in more independent directors; and enhancing the autonomy, capacity and accountability of state electricity regulators
- Addressing inefficiencies in the entire electricity value chain and improving planning and coordination mechanisms
- Improving sector monitoring with the collection, use, and regular updating of operational, financial, and service delivery data
- Improved targeting of subsidies

The report presents the wide variation in experience across Indian states, and identifies successful utilities and practices in some parts of the country that could be adapted in other parts or nationwide.

A draft version of the report has been circulated to the government. The final report—along with the background papers—will be published in FY2014.

## Open Access to Power Grids: International Experiences

In recent decades, many developing and emerging economies have embarked on efforts to enhance the efficiency of their electricity markets. The quest for efficiency often involves structural reforms, such as unbundling and other measures, designed to support greater competition in the power sector. Open access to transmission and distribution grids by market participants is an essential element in the reform process.

"Open access" refers to the possibility for any party selling or buying electricity to make use of transmission and distribution systems, regardless of who owns and operates the power grid, as long as that party pays the costs of using those systems and is subject to transparently defined system security constraints. The flexibility permitted by open access allows for multiple and diverse power supply contracts and contributes to better utilization of resources.

In FY2013, ESMAP completed a study of open access to electricity transmission and distribution grids. Drawing on lessons learned from global experience, the study advises World Bank staff and country clients on effective options to implement open access.

The final report is informed by experience in developing and developed countries, including four relatively centralized power systems (Brazil, Peru, Philippines, and Turkey) and two decentralized systems (India and the United States).

Experience suggests that opening access to the grid is an evolutionary process, in which affording all market participants non-discriminatory access is the first step toward a full-fledged open access regime. Reaping the full benefit of open access requires building a more sophisticated market in which time- and location-specific price signals provide essential information to enhance market efficiency.

For example, Brazil has created the legal framework and institutional structure for open access, as a result of which about a quarter of total consumption in 2010 was transacted in the free market. However, continuing this process will require further reforms, such as price signals for grid congestion and demand response. In Turkey, open access has helped create a dynamic wholesale market for power which has underpinned a major expansion of generation capacity.

Overall, the report identified some common factors that contribute to a successful transition to open access, including:

- Strong, sustained political commitment to competition in the electricity sector, balanced by recognition of the continued need for coordinated power system planning
- Legislation that mandates open access, supports competition, and allows separate contracting for network services
- Market structures that support the unbundling of transmission and distribution facilities from generation and include a competitive wholesale market component
- A strong regulatory body that is operationally and financially autonomous from the government and committed to promoting and protecting competition

BOX 5.1

## THE PHILIPPINES: LAYING THE GROUNDWORK FOR SECTOR-WIDE CHANGES

Despite recent growth, the power sector in the Philippines still faces hurdles, including the lack of modern electricity connections for more than 15 million people, a shortage of generation capacity in some localities, and relatively high electricity costs when compared to neighboring countries. However, the country does have a long-term advantage in the form of its vast renewable energy endowments. The Renewable Act of 2008 set out a broad menu of options to scale up the development of these resources. These include renewable portfolio standards, feed-in tariffs, and priority connection to the grid for renewable power sources. The Department of Energy (DOE) has set an ambitious goal of tripling renewable energy-based generation capacity by 2030.

At the same time, the DOE is committed to bringing electricity access up to 90 percent by 2017, which would require 3.4 million new household connections. Here, a key role is being played by electric cooperatives (ECs), which provide electricity services to rural areas and smaller cities and towns. The government in recent years has made the ECs more accountable for their own supply requirements, which has left some of them struggling to raise capital to maintain and extend service to their communities.

Starting in FY2011, ESMAP supported a World Bank technical assistance program to provide strategic advice to help the Philippines address these and other emerging challenges. This assistance covers power sector financing strategies, cost management and pricing issues, electricity access, and renewable energy policy and regulation. A particular focus has been supporting the government's transition from being the national power supplier of last resort to acting primarily as a policymaker, regulator, and facilitator for privately financed power generation.

This work achieved notable success in February 2013, when the National Grid Management Commission approved an addendum to the national grid code that for the first time established connection requirements and performance standards for variable renewable energy sources being integrated into the national grid. These include solar and wind, which are expected to make up an increasing share of the country's electricity supply, particularly in the Visayas, the Philippines' middle islands.

This is expected to have positive ramifications for the entire national renewable energy effort as defining the provisions for integrating renewables into the grid was seen as the last regulatory hurdle preventing the development of projects eligible for feed-in tariffs.

At the same time, it has become clear that meeting the government's goal of 90 percent access by 2017 would require addressing the issue of the ECs' finances. The Philippines' electricity sector has almost 120 ECs, which serve half the country's electricity customers as well as the vast majority of areas where grid access is still missing. However, only about a quarter of the ECs are regarded to be in good financial health.

In response to this need, the ESMAP-supported project has identified partnership opportunities among the ECs themselves as well as with local commercial finance firms. A technical assistance program has also helped ECs look at issues related to credit risk, tariff methodologies, and corporate governance.

BOX 5.2

### ARMENIA: NEW MODELS FOR POWER SECTOR TARIFFS

In 2010–11, the Government of Armenia and the Public Services Regulatory Commission (PSRC) agreed that electricity tariff increases were not keeping pace with rising costs. An Energy Sector Issues Note released by the World Bank on behalf of the Armenian government during the same period identified the key challenges facing the energy sector and outlined potential solutions to address them, including improvements in power tariff setting methodology. Following on this work, ESMAP supported the development of a national *Power Sector Tariff Study*, which was published in June 2013.

The study assessed the cost recovery levels of Armenia's current electricity tariffs, and estimated long-run marginal costs of electricity service and their impact on residential tariffs. The study also provided recommendations to the Government and the PSRC for improvements to Armenia's current power tariff-setting methodology in order to align seasonal and daily power supply costs with tariffs, and outlined policy measures to mitigate the impact of increased power tariffs on socially vulnerable consumers.

The study also helped identify links in the power supply chain where cost recovery was lagging and helped gauge the extent of the gaps. A number of issues were identified, including limited or no depreciation expense or return on assets for state-owned power companies; a lack of adjustments for inflation despite significant inflationary pressures since 2009; under-recovery of decommissioning charges; and a tariff structure that does not reflect the seasonal and time-of-day variations in the cost of supply.

To mitigate these challenges, the study recommended introducing marginal cost-based tariffs and implementing gradual and predictable tariff increases to avoid rate shocks and negative social impacts. The PSRC is now organizing broad consultations with key stakeholders to explore the study's recommendations, identify the technical assistance needed to put the recommendations into place, and further explore how to mitigate the impact of these changes on the poor and vulnerable.

A global synthesis report and five country studies—Brazil, India, Peru, the Philippines, and Turkey—have been prepared, which will be widely disseminated in FY2014. A companion report on private sector participation in power grids will also be published in FY2014.

## FY2014 AND BEYOND: NEW INITIATIVES

Going forward, ESMAP will continue its demand-driven focus in the area of energy sector strategies and assessments. This work will continue to be carried out primarily through the ABGs to World Bank regional operational units, but ESMAP itself will play an increasing role in taking on work of global significance. During the FY2014–16 Business Plan, ESMAP's work in this area will focus on:

- Governance, planning, and markets
- Pricing and subsidies
- Energy resources and linkages

In an era of expensive oil, fossil fuel subsidies are a growing fiscal drain for many countries.

BOX 5.3

## HIGHLIGHTS OF NEW ESMAP-SUPPORTED ENERGY ASSESSMENTS AND STRATEGIES ACTIVITIES BY THE WORLD BANK'S REGIONAL UNITS

### INTEGRATION OF MINING SECTOR DEMAND FOR POWER SECTOR DEVELOPMENT IN AFRICA

Sub-Saharan Africa's power system suffers from inadequate and unreliable supplies—and households and firms pay a heavy price. If business-as-usual continues, the region will have the widest access deficit and be the only region to experience an increase in population without electricity access by 2030. Leveraging the mining industry's power demand and its capital investments in power infrastructure can transform the development of the regional and national power systems. This study will look at the potential and challenges of power-mining integration. It will estimate the cost savings of various options of integration and identifies the challenges and enablers for realizing savings for the economy.

### POLICY NOTE ON SOCIAL ACCOUNTABILITY IN THE EGYPT ENERGY SECTOR

In cooperation with the Egyptian Electric Utility and Consumer Protection Regulatory Agency (EEUCPRA), the key institution in the country responsible for protecting consumer rights and ensuring that electricity consumers have a voice in sector affairs, this activity will develop a diagnostic study on current systems and practices for and recommend the way forward ensuring consumer protection in Egypt's electricity sector. The diagnostic study will build on the work already being done by the regulator on the current systems and practices for the consumer interface and propose improvements that would build on those and that could be implemented by power sector companies to enhance service delivery, customer feedback, public information, and participation.

### ARMENIA POWER SECTOR POLICY NOTE

Armenia's power sector has a competent regulatory agency which for the past decade has achieved solid results through reforms and restructuring. Despite these achievements, the sector faces a number of challenges. The objective of this activity is to prepare a power sector policy note that identifies and analyzes key issues and recommends actions to overcome bottlenecks. The policy note will inform ongoing government planning and will include an updated electricity demand forecast and an assessment of potential gas supply constraints. This follows on technical assistance supported by ESMAP such as on tariff-setting in Armenia's power sector (see Box 5.2).

These subsidies have often also proved to be regressive, have distorted incentives for innovation and renewable energy use, and have encouraged the wasteful use of energy. Under its pricing and subsidies focus area, ESMAP in FY2014 is launching a **multiyear program centered on supporting countries in their efforts to reform energy subsidies and prices**, by providing assistance on assessing the magnitude of subsidies and their impacts, designing suitable transition paths for reducing subsidies, improving the targeting and delivery of subsidies, and mitigating

the impact of such reforms on the poor and vulnerable. This initiative will provide technical assistance and implementation support to respond to the specific needs of clients and to the country context. At the same time, policy-relevant lessons will be drawn from the large body of existing work on subsidy reform. These lessons will be discussed through peer learning and regional and global forums, as a way to foster knowledge sharing and consensus building.

Water availability is fast becoming a binding development constraint in many parts of the world, but national energy strategies often still do not fully take into account the energy sector's demand for water. As part of the energy resources and linkages focus area, ESMAP is collaborating with the World Bank's Water Anchor on a major study of the water-energy nexus to help integrate energy and water planning. The main objective of this study is to increase capacity at the country level for integrated planning of energy and water investments.

The first study on the emerging threats in this area—entitled ***Thirsty Energy***—will be published in early FY2014. Separately, an ongoing study by ESMAP looks at the issue of subsidized use of energy in water pumping for agriculture in India. The study aims to evaluate alternative ways of delivering subsidies to farmers so as to reduce the financial burden on electricity utilities and to promote the efficient use of water and energy resources.

## RESULTS-BASED APPROACHES TO ENERGY SECTOR DEVELOPMENT

There are financial risks inherent to every development project. The question is how to deliver sustainable results in the face of these challenges. Under a conventional approach, in the event a project fails to deliver expected results, the financial risks of failure are substantially borne by the funder and the funds are usually unrecoverable. By contrast, under a results-based funding approach, the opposite is true: if the project fails to deliver, no payments are made. The fundamental idea of results-based approaches is that payments that would otherwise be made up-front are made contingent on delivery of a pre-agreed set of results, with achievement of the results being subject to independent verification.

Results-based funding is a term used to describe two complementary, although operationally different, concepts: results-based aid and results-based financing. Results-based aid (RBA) refers to funding arrangements between donors and recipient governments, while results-based financing (RBF) refers to funding arrangements between the funder and service providers. In 2012 the World Bank launched an innovative new financing instrument—Program for Results (PforR)—which formally links disbursements to the achievement of tangible and verifiable results. In some countries, for instance, PforR will help increase immunization coverage for children.

Whereas result-based funding approaches are widely used in sectors such as health; information and communications technology; and transport, there has been limited deployment in the energy sector, especially in developing countries. However, in the past few years there is increasing interest in results-based funding in the energy sector from both client and donor countries. Stakeholders are increasingly demanding programs that will deliver "real" results. The Energy+ Partnership being led by Norway and Energizing Development, a sustainable energy access program implemented by GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit), have both supported results-based approaches to energy projects and activities. Additionally, the Scaling-up Renewable Energy Program (SREP), part of the Climate Investment Funds, is actively encouraging RBF approaches.

In FY2012, in direct response to these developments and growing client demand, ESMAP launched an initiative to assess how, and under what circumstances, results-based funding—both RBA and RBF—can be used to specifically improve outcomes and scale-up financing for energy sector development. ESMAP's results-based funding initiative is divided into three components:

- Analytical work on indicators and the economic rationale for selecting and then designing results-based funding instruments
- Knowledge management to disseminate guidance on designing results-based programs and projects and share lessons learned from other sectors
- Operational support to the World Bank regional energy units to develop a pipeline of projects to test out new results-based concepts and ideas

*(continues on next page)*

Considering the relative lack of experience with results-based funding in the energy sector, ESMAP's initiative specifically set out to draw on lessons from other sectors

## ACCOMPLISHMENTS

In FY2013, the initiative accomplished its first objective with the publication of ***Results-Based Financing in the Energy Sector: An Analytical Guide***. The *Guide* serves as the intellectual backbone of the ESMAP initiative and is being used to help inform results-based funding projects within and outside the World Bank.

Providing a conceptual examination of various RBF mechanisms in turn, the *Guide* is aimed at World Bank operational staff or donors helping governments that are directly involved in implementing results-based schemes in the energy sector. It provides very specific guidance on how to design RBF projects, and draws conclusions about when, and under which circumstances, using RBF is desirable. For example, a government may choose to switch from incandescent to energy efficient light bulbs in some or all of its buildings and part of the contract payment could depend on defined results, such as the speed at which the switch takes place. Further, the *Guide* clarifies terminology within the overarching field of results-based funding and provides an exhaustive literature review that has implications beyond the energy sector.

## NEXT STEPS

Slated for FY2014 is a follow-up study looking at the related issues associated with RBA. This follow-up report will explore the challenges and variations of RBA arrangements between bilateral donor agencies and recipient governments.

At its core, the RBF program is a multi-stakeholder exercise that includes funding options not wholly under the purview the World Bank. Yet FY2013 showed the beginnings of tangible interest in developing World Bank operational activities using results-based approaches in the energy sector. So far, $300,000 has been approved to develop a cookstove project in Indonesia and ESMAP is providing technical input to a similar activity in Uganda. ESMAP is not only concerned with achieving results, but also strengthening institutional capacity for the sustainability of those results.

Outside of the Bank, ESMAP will continue to cultivate partnerships with Energy+, Energizing Development, and the Climate Investment Funds. Going forward, the focus will be on supporting development partners and client countries interested in piloting results-based funding projects in the energy sector, particularly within World Bank-funded projects or PforR operations.

KAU NOA TONGA
KE TAU NETIPOLOI

CHAPTER 6

# FINANCIAL REVIEW

## CONTRIBUTIONS

ESMAP received a total of $28.2 million from its donors in FY2013. Total receipts included a supplemental contribution from Denmark which enabled the launch of the SE4ALL Technical Assistance Program (see Chapter 3).

Table 6.1 shows actual receipts from individual donors for the period FY2010–13 and receipts and pledges for FY2014.

In FY2013, Japan joined as an ESMAP donor with a contribution of $9 million for the SIDS DOCK Support Program Multi-Donor Trust Fund (MDTF) (see p. 26).

TABLE 6.1

**Overview of Donor Contributions to ESMAP FY2010–14** *($ Thousands)*

| | | | | | 2014 | | Total Receipts | |
|---|---|---|---|---|---|---|---|---|
| **Country** | **2010** | **2011** | **2012** | **2013** | **Receipts** | **Pledges** | **10–13** | **%** |
| Australia | 453 | 1,067 | 3,030 | | | | 4,550 | 5.5% |
| Austria | 424 | 2,680 | — | | | | 3,104 | 3.7% |
| Canada | 100 | — | — | | | | 100 | 0.1% |
| Denmark | 1,849 | 3,913 | 9,111 | 8,737 | 6,091 | | 23,610 | 28.5% |
| Finland | 741 | — | — | 787 | | | 1,527 | 1.8% |
| France | — | — | 844 | — | | | 844 | 1.0% |
| Germany | 2,185 | 1,993 | 3,350 | 1,338 | | 1,321 | 8,866 | 10.7% |
| Iceland | 200 | — | 300 | 300 | | | 800 | 1.0% |
| Japan | — | — | — | — | 9,000 | | — | 0.0% |
| Lithuania | — | 27 | — | 33 | | | 60 | 0.1% |
| Netherlands | — | 11,286 | 2,900 | 5,800 | | | 19,986 | 24.1% |
| Norway | 750 | 839 | 853 | 3,750 | | 3,343 | 6,191 | 7.5% |
| Sweden | — | — | 2,311 | 782 | | 733 | 3,093 | 3.7% |
| United Kingdom | 1,961 | — | — | 6,420 | | 9,438 | 8,381 | 10.1% |
| World Bank | 437 | 272 | 645 | 310 | | | 1,664 | 2.0% |
| **Grand Total** | **9,100** | **22,077** | **23,343** | **28,256** | **15,091** | **14,835** | **82,776** | **100%** |

Note:

- This table covers receipts received over this period by three MDTFs: the ESMAP MDTF, the Clean Energy Investment Framework (CEIF) MDTF, which includes the AFREA program, and the SIDS DOCK MDTF.

## DISBURSEMENTS

ESMAP disbursed $16.9 million in FY2013—roughly the same level as FY2012. The pace of disbursements is expected to increase with the scale up of ESMAP's new programs such as Renewable Energy Mapping, GGDP, and the SIDS DOCK Support Program.

Table 6.2 shows ESMAP disbursements for the last three fiscal years, with project costs broken out for each region and for ESMAP global programs. Program management and administration costs are broken out by category.

Program Management and Administration costs have generally stayed at the same level over the last three years. These include expenditures on program M&E, as well as knowledge exchange and dissemination, which are expected to increase as greater emphasis has been placed on these areas under the new Business Plan.

TABLE 6.2

**ESMAP Disbursements, Fiscal Years 2011–2013** *(US$ Thousands)*

| | FY11 | | FY12 | | FY13 | |
|---|---|---|---|---|---|---|
| Project Cost | 16,211.90 | 89% | 14,867.81 | 87% | 14,636.94 | 87% |
| Africa | 6,317.98 | | 6,915.75 | | 5,199.04 | |
| East Asia | 934.69 | | 517.91 | | 706.64 | |
| Europe & Central Asia | 537.59 | | 576.36 | | 1,201.05 | |
| Latin America & Caribbean | 1,278.87 | | 775.63 | | 913.23 | |
| Middle East & North Africa | 1,020.48 | | 600.23 | | 839.36 | |
| South Asia | 726.00 | | 867.32 | | 346.01 | |
| ESMAP Global Programs | 5,396.28 | | 4,614.61 | | 5,431.61 | |
| Program Management & Administration | 2,040.18 | 11% | 2,129.08 | 13% | 2,273,13 | 13% |
| Program Management | 988.44 | 48% | 1,080.64 | 51% | 997.16 | 44% |
| Governance (CG, TAG) | 69.76 | 3% | 91.57 | 4% | 83.53 | 4% |
| Resource Management/ Trust Fund Administration | 253.91 | 12% | 215.14 | 10% | 230.38 | 10% |
| Portfolio Management (M&E) | 253.66 | 12% | 245.89 | 12% | 316.20 | 14% |
| Knowledge Forums | 48.43 | 2% | 28.78 | 1% | 102.50 | 5% |
| Communication and Outreach (publications, website, and other dissemination) | 425.98 | 21% | 467.06 | 22% | 543.36 | 24% |
| **Total** | **18,252.08** | **100%** | **16,996.89** | **100%** | **16,910.07** | **100%** |
| Of which: | | | | | | |
| Funded by Donors | 17,388.56 | | 16,006.34 | | 16,302.79 | |
| Funded from World Bank Budget | 272.72 | | 640.23 | | 350.35 | |
| Funded from Fee Income | 590.80 | | 350.32 | | 256.93 | |

Notes:

- ESMAP global programs cover global analytical and advisory activities and include activities managed by the ESMAP core team, as well as activities managed by the Sustainable Energy Department, the Environment Department, and other units of the World Bank's Sustainable Development Network.
- It is important to note that a portion of the expenditures under ESMAP global programs is associated with work performed by ESMAP technical staff for clients through the World Bank's regional units.
- The total administration cost for Program Management and Administration in FY2013 includes $184,700 for the cost of management of the SIDS DOCK Support Program.

## BREAKDOWN BY PROGRAM AREA

Table 6.3 shows total ESMAP spending for FY2013 by program area:

- Energy Assessments and Strategies Program (EASP)
- Energy Access
- Clean Energy
- Energy Efficiency Cities Initiative (EECI)

The EASP category also includes renewable energy, energy efficiency, and low carbon development activities as part of energy sector assessments and strategies work.

TABLE 6.3

**ESMAP Disbursements by Program Area, FY2013** *(US$ Thousands)*

| | AFR | | EAP | ECA | LCR | MNA | SAR | ESMAP Global Programs | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | ABG | AFREA | ABG | ABG | ABG | ABG | ABG | | |
| **EASP** | 271.00 | | 381.08 | 443.19 | 110.14 | 125.70 | 256.67 | 686.21 | **2,274.0** |
| **Energy Access** | 892.77 | 3,772.53 | 100.84 | — | 155.39 | — | — | 1,337.80 | **6,259.3** |
| **Clean Energy** | 30.04 | | 150.65 | 109.71 | 359.22 | 584.66 | 89.34 | 2,542.18 | **3,865.8** |
| **EECI** | 232.68 | | 74.05 | 648.14 | 288.47 | 128.99 | — | 865.40 | **2,237.7** |
| | **1,426.49** | **3,772.53** | | | | | | | |
| | | **5,199.02** | **706.62** | **1,201.04** | **913.22** | **839.35** | **346.01** | **5,431.59** | **14,636.9** |

World Bank Regions: **AFR**-Africa, **EAP**-East Asia and Pacific, **ECA**-Europe and Central Asia, **MNA**-Middle East and North Africa, **LCR**-Latin America and the Caribbean, **SAR**-South Asia.

Of the funding for the World Banks's regional units in FY2013:
- 51% was through the ABG process under the ESMAP MDTF
- 49% was as funding for the AFREA program under the CEIF MDTF

Figures 6.1 and 6.2 illustrate the division of ESMAP spending by program area in FY2013, for the entire program and for ESMAP own-managed activities.

FIGURE 6.1

**ESMAP Spending by Program Area FY2013** *(Entire Program)*

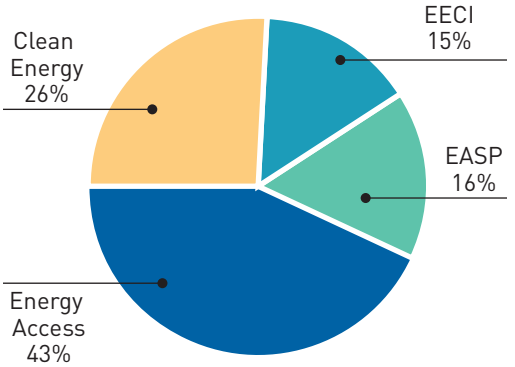
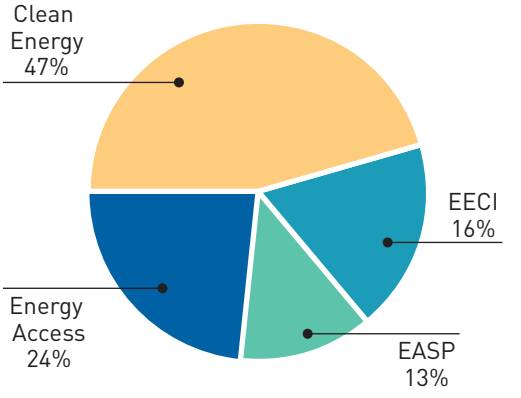



FIGURE 6.2

**ESMAP Spending by Program Area FY2013** *[ESMAP Own-Managed Activities]*




Notes:

- The EASP category also includes renewable energy, energy efficiency, and low carbon development activities as part of energy sector assessments and strategies work.
- Under the entire program, the Energy Access category includes monies spent under the AFREA program.

ANNEX I

# PROCEEDINGS OF CONSULTATIVE GROUP MEETING, 2013

## CONSULTATIVE GROUP MEETING FOR ENERGY TRUST-FUNDED PROGRAMS | ESMAP AND AFREA

### 28 February – 1 March 2013, Washington, DC

The Consultative Group (CG) meeting for the World Bank-managed Energy Trust-Funded Programs was held in Washington, DC on February 28–March 1, 2013. The meeting was chaired by Mr. Vijay Iyer, Director, Sustainable Energy Department, in the Bank's Sustainable Development Network.

The outline below provides the highlights and follow-up actions for the agenda items related to ESMAP. For more details regarding each session, please refer to the CG workspace (*www.esmap.org/cg*) for all reports, briefing materials, and presentations.

**Session 1 | Africa Energy Sector Priorities**

Following the presentation by Mr. Jamal Saghir, the Director of Africa Region's Sustainable Development Department, on Africa's specific challenges in the energy sector, CG members posed questions regarding: potential for partnership/cooperation with the International Finance Corporation (IFC) to address financing gaps; opportunities to access Climate Investment Funds (CIF); and the importance of exercising selectivity in the Bank's interventions in the region.

**Session 2 | AFREA**

The AFREA II program was presented by Ms. Meike van Ginneken and Mr. Lucio Monari, Sector Managers for the Africa Energy Units.

***The CG endorsed the overall strategic direction of AFREA II***. During the discussion, the following points were raised:

i. The CG suggested that AFREA reporting cover all four pillars of the program rather than stress its success in leveraging Bank and other funds.

ii. The ESMAP Program Manager responded to questions regarding AFREA's management structure: AFREA is an ESMAP program and supported through the ESMAP Multi-Donor Trust Fund (MDTF). Program management is delegated to the Africa Energy Practice Group. This is different from the Asia Sustainable and Alternative Energy Program (ASTAE), which is a separate MDTF, managed by the World Bank's East Asia and Pacific and South Asia regions. The ESMAP Program Manager further clarified that current funding pledges to ESMAP would be sufficient for about $12 million in allocations for AFREA II, leaving a gap of $38 million in its 5-year programming.

iii. *South-South knowledge sharing and learning* was highlighted as an important element of AFREA, and it was noted that AFREA (as well as ESMAP overall) is working with the World Bank Institute to promote this important agenda.

iv. *Coordination around SE4ALL, as well as more general inter-agency coordination with bilateral agencies* at the country level, is ongoing. Ms. van Ginneken outlined why and how coordination needs and arrangements should be tailored for specific countries, and stressed the importance of allowing the countries themselves to determine donor coordination processes.

v. *Capacity building, policy incentives, and technical assistance for promotion of solar thermal energy* should be strongly considered by ESMAP´s Business Plan FY2014–16, especially for AFREA. Solar thermal energy is useful not only for heating water in social institutions, such as schools, hospitals, etc., or in laundries, hotels, households, but also increasingly for industrial processes, especially food processing and production.

**Session 3 | ESMAP External Evaluation – Update on Action Plan**

i. *Gender*. ESMAP provided a detailed outline of the work undertaken to mainstream gender since the 2012 CG Meeting.

ii. *Water-Energy nexus*. ESMAP is working with the Bank's Water and Energy units to develop tools to take into account trade-offs related to addressing water-energy issues. This is a multi-year effort that will include joint water and energy modeling, grounded in specific countries (South Africa, Morocco). ESMAP is also supporting the South Asia region to conduct a cross-sectoral study on energy-water security.

iii. *Collaborative activities with city organizations.* It was noted that ESMAP has initiated outreach to city organizations and with the new high-level World Bank engagement on this agenda, ESMAP has the opportunity to strengthen collaboration with relevant city organizations.
   - ESMAP will follow up with bilateral agencies to explore potential synergies and exchange knowledge on gender activities, as well as water-energy nexus activities.

**Session 4 | ESMAP Annual Portfolio Review**

The ESMAP Program Manager highlighted key achievements over the past year, as well as lessons learned from the annual portfolio review. Due to time constraints, it was suggested that discussions related to the portfolio review be integrated into the session on the new business plan.

**Session 5 | Technical Advisory Group (TAG) Report to the CG**

i. *Gender*. The TAG noted that gender considerations could be more systematically integrated into ESMAP's programs. The CG welcomed the increased emphasis on gender while acknowledging that gender issues are not always uniformly relevant in ESMAP's activities.
   - ESMAP will continue to improve its gender analysis, have gender as a natural component of all projects/programs, allocate the necessary resources, and establish key performance indicators.

ii. *Monitoring and Evaluation (M&E).* The TAG reported that M&E has become more systematic and recognized that gender-sensitive indicators have been incorporated.

iii. *Energy Efficient Cities*. TAG recommended that EECI be adequately resourced given the growing importance of urbanization in emerging economies.
   - Budget allocation for EECI in Business Plan to be increased.

iv. *Potential additional areas for ESMAP.* The TAG presented the need for a definitive analytical report on the most effective subsidy and de-risking instruments and for advice to clients on how much risk premium is needed to

promote renewable energy options. Other topics discussed were: opportunities and constraints related to results-based aid in the energy sector and the need for objective advice on cap and trade schemes.

Regarding the cap and trade scheme, the Chair confirmed that another unit in the Bank is leading this work, and ESMAP will need to assess whether it has a comparative advantage in this area.

The CG noted that there are many topics that would benefit from ESMAP's engagement, but it was acknowledged that ESMAP will need to remain focused on its comparative advantage and within its capacity, particularly given that its three-year business plan is not yet fully funded.

v. *Cooperation between ESMAP and development partners*. The TAG acknowledged that ESMAP has collaborated with development partners on specific programs, and observed that many bilateral development agencies appear to have reduced capacity to fully engage with programs like ESMAP.

The ESMAP Program Manager confirmed that a more systematic approach to collaboration with bilateral partners is proposed in the new business plan and shared some achievements in this regard: improved information flow (e.g., regular circulation of information on ESMAP-funded activities and access to ESMAP's M&E Portal); and a pilot knowledge exchange event in Paris in November 2012.

- It was agreed that CG members would identify how ESMAP could further improve its cooperation with bilateral partners in a specific country or program.

**Session 6 | ESMAP Work Program and Budget for the FY2014–16 Business Plan**

The ESMAP Program Manager provided an outline of the FY2014–16 work program and budget:

i. Out of the total $137 million budgeted for the 3-year business plan, $15 million is dedicated to the SIDS-DOCK MDTF and the remaining $122 million for the global core ESMAP MDTF (including for AFREA II). This is an increase of approximately $20 million from cumulative funding levels over the past three years. The increase is driven by ESMAP's proposed work in SE4ALL, Low Carbon Project Preparation Facility (PPF), and AFREA II.

- ***FY2014–16 Business Plan is approved***, subject to agreed revisions.

ii. Given that donors will not be able to fill the "gap" by the start of the new business plan, ESMAP proposed to make the following adjustments to its proposed work program:

a. PPF | ESMAP will launch this work in FY2015; work in FY2014 will be limited to preparation of concept note.

b. SE4ALL | ESMAP will not expand the program beyond the currently planned number of countries.

- ESMAP will share with the CG concept notes on PPF and SE4ALL.

c. Prioritization of activities by sequencing them over the three years of the business plan period.

- ESMAP will continue to explore opportunities to share knowledge and learning through workshops, conferences in donor countries and in the field, and will seek to work with bilateral agencies where feasible.

iii. The CG agreed that the new business plan strikes the right balance among the proposed activities, and *approved the FY2014–16 Business Plan, subject to revisions agreed at the meeting*. Key points made by CG members included:

a. While it is important for ESMAP to demonstrate influence on the World Bank's strategic directions, ESMAP should also focus on leveraging the resources and activities of other development partners beyond the World Bank. Therefore, ESMAP should enhance dissemination outside the Bank.
   - Regarding the proposed inclusion of qualitative indicators, ESMAP is currently working on "impact stories" to demonstrate the influence that ESMAP-funded activities have had on policies, programs, and results in client countries. These narrative stories will be shared in the coming months and could also be used for South-South knowledge exchange.

b. ESMAP's role in launching country actions under SE4ALL was welcomed. ESMAP should ensure that country-level donor coordination with bilateral agencies and regional development banks is a key feature of the SE4ALL Technical Assistance program. CG also appreciated that the focus is on a number of fragile states.

c. The importance of good governance in energy sector development.

d. ESMAP should maintain flexibility in the business plan to be able to take on emerging priorities.

e. EECI should be scaled up; focus on urban and peri-urban energy access was welcomed.
   - The business plan would be adjusted to sequence activities, taking into account funding availability and staff capacity.

f. ESMAP needs to initiate a knowledge product on the links between energy and food, as part of the energy-food-water nexus work.

g. Emphasis on "value for money" was noted.

h. ESMAP's M&E system has been substantially strengthened and should enable better tracking of deliverables.

i. ESMAP should continue to enhance its capacity building and knowledge management activities, for example, through partnerships with the World Bank Institute.

j. The business plan should include a results chain and risk matrix.
   - It was agreed to add a risks analysis matrix and a results chain in the Business Plan.

k. The results framework should have a higher level outcome indicator that demonstrates transformative changes, such as influence on global investment flows.

l. The increased emphasis on linking analytical and advisory activities more closely with country-level implementation was welcomed as to make policy research and analysis more usable. An example was ESMAP's support to Norway's Energy + country programs, drawing on the analytical work on

results-based funding approaches and on defining and measuring energy access.

m. AFREA should collaborate with regional energy centers in Africa.

**Other Action Items:**

- Proposed work on energy subsidy reform would be designed to be scalable, responsive to demand, and expandable as additional resources become available. The concept note on the initiative will be circulated to the CG.
- Some CG members agreed to host knowledge exchange events and also invited ESMAP to forthcoming conferences in Europe. ESMAP and the CG will continue to communicate in this regard.

In response to the discussion on governance, the Chair clarified that the World Bank's policies and guidelines are applied to all ESMAP activities, and that promoting energy sector governance is a key objective of many Annual Block Grants through ESMAP's Energy Assessments and Strategies Program.

ESMAP informed the CG that it had submitted Terms of Reference for Junior Professional Officers through the World Bank's Donor Funded Staffing Program, particularly for assignments related to geothermal development, energy access for the urban poor, and energy efficient cities.

ANNEX II

# ESMAP SUMMARY OF RESULTS, FY2013

The following table gives a quantitative summary of ESMAP's results for fiscal year 2013. Annex III gives details of ESMAP outputs for the year, and Annex V lists completed, new, and ongoing activities for the fiscal year.

For the latest details of ESMAP's activities, development outcomes achieved, and M&E framework, go to www.esmap.org and click on the "Results" tab.

| | Objective | Indicator | Actual Values Fiscal Year 2013 |
|---|---|---|---|
| **Outcomes** | **Development Financing Informed:**<br>Client countries provided with "just-in-time" technical assistance for pre-investment activities necessary to resolve program design issues and offer additional options. | Existing operations informed;<br>Government expenditure informed;<br>Mobilization of non-Bank resources informed;<br>Preparation of new operation informed | **9 World Bank lending operations informed**<br>• Urban Scale Building Energy Efficiency and Renewable Energy Project (China /$12 million)<br>• Beijing Rooftop Solar Photovoltaic Scale-Up (Sunshine Schools) Project (China /$120 million)<br>• Vietnam Climate Change Development Policy Loan 2 (Vietnam /$70 million)<br>• First Competitiveness and Growth Development Policy Operation (Georgia /$60 million)<br>• Second Competitiveness and Growth Development Policy Operation (Georgia /$60 million)<br>• Turkey SME Energy Efficiency Project (Turkey /$200 million)<br>• Geothermal Power Generation Project (Djibouti /$7.1 million)<br>• Helwan South Power Project (Egypt /$585 million)<br>• OSE Response for Climate Change Project (Uruguay /$42 million)<br>**Total influenced volume: $1,156 million** |

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*(continued)*

| | Objective | Indicator | Actual Values Fiscal Year 2013 |
|---|---|---|---|
| **Outcomes** (*continued*) | **Policy & Strategy Informed and Client Capacity Increased:**<br>Increased institutional capacity of ESMAP client countries to plan, manage, and regulate the implementation of policies, strategies, and programmes that deliver clean, reliable, and affordable energy services required by their citizens for poverty reduction and environmentally sustainable economic growth. | Bank country strategy informed/ influenced;<br>Bank sector strategy informed/ influenced;<br>Contributed to stakeholder involvement;<br>Development community/ partner policy/ strategy informed;<br>Government policy/strategy informed;<br>Public debate stimulated/ initiated<br>Client is recognized with good practice or similar awards;<br>Design capacity strengthened;<br>Implementation capacity strengthened | **Policy/Strategy Informed:**<br>**18 outcomes achieved**<br>EAP: China (2)<br>ECA: Serbia, Armenia, Azerbaijan,<br>LCR: Colombia, Costa Rica, Guatemala, Peru<br>SAR: India, Maldives, Philippines<br>Global:<br>Tool for Rapid Assessment of City Energy (TRACE)<br>Smart Grids Knowledge Exchange Platform<br>Gender & Energy Resources<br>Climate Vulnerability in the Energy Sector<br>Energy Sector Low Carbon Development Operational Support<br>Energy Access for the Urban Poor<br><br>**Client Capacity Increased:**<br>**9 outcomes achieved**<br>EAP: Indonesia<br>ECA: Armenia, Turkey<br>LCR: Peru<br>Global: Tool for Rapid Assessment of City Energy (TRACE)<br>Model for Electricity Technology Assessment (META)<br>Gender & Energy<br>Clean Energy Staff Training and Knowledge Platform<br>Smart Grids Knowledge Exchange Platform |

*(continued)*

| | Objective | Indicator | Actual Values Fiscal Year 2013 |
|---|---|---|---|
| **Outcomes** (*continued*) | **Knowledge Increased/ Deepened and Innovative Approaches & Solutions Generated:**<br>ESMAP-supported research and analyses strengthen the sector's knowledge and evidence-base to deliver improved clean energy access, energy efficiency and generation in developing countries. | Disseminated best practices;<br>Facilitated exchange of best practice with clients;<br>Facilitated exchange of best practice with partners<br>New innovative approach developed;<br>Other action/ behavior adopted or observed<br>New innovative approach fostered; | **Knowledge Increased:**<br>**5 outcomes achieved**<br>ECA: Georgia<br>LCR: Honduras<br>Global:<br>Electricity Transmission Planning<br>Energy Access for the Urban Poor<br>Smart Grids Knowledge Exchange Platform<br><br>**Innovative Approaches & Solutions Generated:**<br>**3 outcomes achieved**<br>AFR: Nigeria<br>Global: Model for Electricity Technology Assessment (META)<br>Energy Adaptation and Country Briefs |
| **Outputs** | Economic and Sector Work (ESW) and Technical Assistance (TA)<br>Research and Knowledge Products<br>Academic mentions<br>Impact Stories<br>Peer-reviewed research | Number of research (ESW, TA) and knowledge products published; # academic mentions; # impact stories developed and disseminated; # pieces of peer-reviewed research. | Total AAA outputs (ESW and TA): 72<br>Total Knowledge Products: 89<br>Total number of academic references of ESMAP products/knowledge: 161<br>Total number of peer-reviewed research: 6<br>Total number of Impact Stories published: 4 |

ANNEX III

# ESMAP PROGRAM OUTPUTS, FY2013

## CLEAN ENERGY

| Analytical & Advisory Activities | Economic and Sector Work: Sector or Thematic Reports Technical Assistance: Implementation /Advisory Reports, Event Proceedings Documents |
|---|---|
| China | China: West or East Wind – Getting the Incentives Right |
| Global | Geothermal Handbook: Planning and Financing Power Generation |
| Global | Low Carbon Growth Country Studies Program: Lessons Learned from Seven Country Studies |
| Lebanon | Wind Power Development Study of Lebanon (Phases I, II, III) |
| MNA | Business Plan for a Climate Innovation Center in Morocco |
| MNA | Competitiveness Assessment of MENA Countries to Develop a Local Solar Industry |
| MNA | Local Manufacturing Potential for Solar Technology Components in Egypt Industry |
| Nepal | Climate Change and Energy Vulnerability Country dashboard |
| Turkey | Cumulative Environmental Impact Assessment for Hydropower Projects in Turkey |
| Uzbekistan | Climate Change and Energy Vulnerability Country dashboard |
| Vietnam | Climate Change and Energy Vulnerability Country dashboard |
| Yemen | Technical Assistance for the Promotion of Wind Power Development |
| Zambia | Climate Change and Energy Vulnerability Country dashboard |
| **Knowledge Products** | **Toolkits, Operational Guides, Models, Handbooks, Databases, Internal and External Trainings, Forums, and Workshops** |
| Conference | Financing Clean Energy Projects within the Caribbean: Renewable Energy Forum 2012 (Southampton, Bermuda, Sep 2012) |
| Tool | MACTool Excel-Based, v1.0 (released and available at *www.esmap.org*) |
| Toolkit | Excel-based and processed content dissemination for screening tool (Acclimatise) |
| Training | Clean Energy Staff Training and Knowledge Platform: Eight Modules—Wind, Solar PV, CSP, Geothermal, Bioenergy, Grid Integration, Policy Incentives, Financing of RE and Projects Due Diligence (Washington, DC, Jul-Dec 2012) |
| Training | EFFECT Online-Interactive Facilitated Training (Oct 2012) |
| Training | EFFECT Trainings & Implementation in Indonesia (Nov 2012, Jan 2013, Mar 2013) |

*(continued on next page)*

## CLEAN ENERGY *(continued)*

| | |
|---|---|
| Training | EFFECT Trainings & Implementation in Malawi (Nov 2012, Jan 2013, Mar 2013) |
| Training | EFFECT Trainings & Implementation in Malaysia (Nov 2012, Jan 2013, Mar 2013) |
| Training | EFFECT Trainings & Implementation in Philippines (Nov 2012, Jan 2013, Mar 2013) |
| Training | EFFECT Trainings & Implementation in Thailand (Nov 2012, Jan 2013, Mar 2013) |
| Training | EFFECT Trainings & Implementation in Vietnam (Nov 2012, Jan 2013, Mar 2013) |
| Training | MACTool Training & Implementation in Brazil (Jul 2012) |
| Training | MACTool Training & Implementation in Ukraine (Mar 2013) |
| Training | MACTool Training & Implementation in Vietnam (Oct 2012) |
| Training | MACTool Training to AusAid and Tetratech (Australia, Jan 2013) |
| Website/online Platform | Smart Grid Technologies Dissemination Platform |
| Workshop | Global Geothermal Development Plan (ESMAP Knowledge Exchange Forum (KEF), Paris, France, Nov 2012) |
| Workshop | Jawaharlal Nehru National Solar Mission: Achievements and Lessons Learned (Washington DC, Jun 2013) |
| Workshop | Renewable Energy Integration: Natural Gas as Enabler for Renewable Power (Washington DC, Apr 2013) |
| Workshop | Renewable Energy Integration: Solar Energy in Hybrid Plants for Off-Grid Power Supply (Washington DC, May 2013) |
| Workshop | Renewable Energy Resource Mapping: In-country Implementation and Opportunities for Co-funding (ESMAP KEF, Paris, France, Nov 2012) |
| Workshop | Smart Grids Knowledge Exchange Portal (Washington DC, Aug 2012) |
| Workshop | Smart Grids, Competition, and Regulation (Washington DC, Sep 2012) |
| Workshop | Transmission and Distribution Automation and Launch of the Smart Grids Knowledge Exchange Portal (Washington DC, Aug 2012) |
| Workshop | Vietnam Low Carbon Development Forum (Hanoi, Jul 12–17 2012) |
| Workshop | Vietnam's 2010–2030 Business-as-Usual Scenario (Hanoi, Nov 14–15, 2012) |

## ENERGY ACCESS

| Analytical & Advisory Activities | Economic and Sector Work: Sector or Thematic Reports<br>Technical Assistance: Implementation /Advisory Reports, Event Proceedings Documents |
|---|---|
| Africa | Africa Clean Cooking Energy Solutions Initiative (ACCES) |
| Africa | Commercial Woodfuel Production: Experience from Three Locally Controlled Wood Production Models |
| Global | Global Tracking Framework Report for Sustainable Energy for All |
| Global | Household Energy for Cooking: Project Design Principles |
| Global | State of the Global Clean and Improved Cooking Sector |
| LCR | What Have We Learned about Household Biomass Cooking in Central America |
| Rwanda | Extending Access to Energy: Lessons from a Sector-Wide Approach (SWAp) |
| **Knowledge Products** | **Toolkits, Operational Guides, Models, Handbooks, Databases, Internal and External Trainings, Forums and Workshops** |
| Brochure | Integrating Gender Considerations into Energy Operations |
| Forum | Gender in Energy & Extractive Industries (SDN Forum 2013, Washington DC, Mar 2013) |
| Online Resources | Gender: Social Inclusion in the Energy Sector |
| Workshop | Challenges and Opportunities to Universal Access to Clean Biomass Cookstoves in Central America (Nicaragua, May 2013) |
| Workshop | Household Energy Access: Towards Sustainable Household Energy for All (Clean Cooking Forum, Cambodia, Mar 2013) |
| Workshop | Integrating Gender within World Bank Energy Sector and Africa Clean Cooking Energy Solutions (ACCES) (Clean Cooking Forum, Cambodia, Mar 2013) |
| Workshop | Joint ESMAP-Social Development Brown Bag Lunch: Gender in Energy and Extractive Industries: A Briefing for Social, Gender and Energy Specialists (Washington DC, Apr 2013) |
| Workshop | Power-Up: Electricity Access Game Show (SDN FORUM 2013, Washington DC, Mar 2013) |
| Workshop | Sustainable Energy for All Technical Assistance (ESMAP KEF, Paris, France, Nov 2012) |
| Workshop | What's Cooking in East Africa? Spotlight on East Africa Markets (Clean Cooking Forum, Cambodia, Mar 2013) |

## ENERGY ACCESS | AFREA

### A. Africa Clean Cooking Energy Solutions (ACCES)

| | |
|---|---|
| **Analytical & Advisory Activities** | **Economic and Sector Work: Sector or Thematic Reports Technical Assistance: Implementation /Advisory Reports, Event Proceedings Documents** |
| Africa | Biomass Energy Initiative for Africa (BEIA) Close-Out Meeting |
| Africa | Technical Assessment of Cookstove Projects for the World Bank Biomass Energy Initiative for Africa |
| Africa | Wood-based Biomass Energy Development for Sub-Saharan Africa: Issues and Approaches |
| **Knowledge Products** | **Toolkits, Operational Guides, Models, Handbooks, Databases, Internal and External Trainings, Forums and Workshops** |
| Consultation | Consultation workshops in Senegal and Uganda; stakeholder interviews in Kinshasa |
| DRC, Uganda | Consumer Research Study |
| Senegal | Market Assessment |
| Uganda | Results-based Financing Study |
| Website | ACCES website |

### B. Africa Electrification Initiative (AEI)

| | |
|---|---|
| **Analytical & Advisory Activities** | **Economic and Sector Work: Sector or Thematic Reports Technical Assistance: Implementation /Advisory Reports, Event Proceedings Documents** |
| Africa | Electricity Connection Costs and Electricity Access in Sub-Saharan Africa |
| Africa | Electricity Sector Data Analysis for Sub-Saharan Africa |
| Africa | From the Bottom Up: Using Small Power Producers to Promote Electrification and Renewable Energy in Africa. An Implementation Guidebook for Regulators and Policymakers |
| Africa | Lighting Africa Operational Toolkit |
| **Knowledge Products** | **Toolkits, Operational Guides, Models, Handbooks, Databases, Internal and External Trainings, Forums and Workshops** |
| AEI online Network Posting | Developing a Carbon Development Mechanism Program of Activities: Lessons Learned from Senegal's CFL Distribution Program |
| Conference | 3rd International Off-Grid Lighting Conference and Trade Fair (Lighting Africa; Senegal, Nov 2012) |

*(continued on next page)*

## ENERGY ACCESS | AFREA *(continued)*

| | |
|---|---|
| Workshop | Regulatory Review of the Power Purchase Agreements in Tanzania (Washington DC, Jul 2012) |

### C. Africa Gender and Energy Program

| **Analytical & Advisory Activities** | **Economic and Sector Work: Sector or Thematic Reports Technical Assistance: Implementation /Advisory Reports, Event Proceedings Documents** |
|---|---|
| Africa | Report: Expanding Women's Role in Africa's Modern Off-Grid Lighting Market (English and French) |
| Benin | Developing a Gender Assessment and Action Plan for Benin's Rural Energy Program |
| Kenya | Gender Assessment for Ministry of Energy and Kenya Power and Lighting Company |
| Senegal | Implementing Gender Action in Senegal's Rural Energy Program |
| Tanzania | Implementation of Gender Action Plan and Capacity Building for Tanzania's Rural Energy Agency |
| **Knowledge Products** | **Toolkits, Operational Guides, Models, Handbooks, Databases, Internal and External Trainings, Forums and Workshops** |
| Video | Energy to Change Women's Lives in Africa \| Senegal |
| Workshop | What is Gender Mainstreaming and How to Empower Women Through Cookstove Solutions (Global Alliance for Clean Cookstoves Forum, Cambodia, Mar 2013) |

### D. Biomass Energy Initiative for Africa (BEIA; Bank Executed)

| **Knowledge Products** | **Toolkits, Operational Guides, Models, Handbooks, Databases, Internal and External Trainings, Forums and Workshops** |
|---|---|
| Workshop | Biomass Energy Initiative for Africa (BEIA) Close out Workshop (Tanzania, Sep 2012) |

### E. NIGERIA Climate Change Assessment

| **Analytical & Advisory Activities** | **Economic and Sector Work: Sector or Thematic Reports Technical Assistance: Implementation /Advisory Reports, Event Proceedings Documents** |
|---|---|
| Nigeria | Assessing Low-Carbon Development in Nigeria: An Analysis of Four Sectors |
| Nigeria | Low-Carbon Development: Opportunities for Nigeria |
| **Knowledge Products** | **Toolkits, Operational Guides, Models, Handbooks, Databases, Internal and External Trainings, Forums and Workshops** |
| Workshop | Nigeria Climate Risk Assessments Workshop (Nigeria, Dec 2012) |

## ENERGY ACCESS | AFREA *(continued)*

### F. Rwanda Sustainable Energy Capacity Development Project

| | |
|---|---|
| **Analytical & Advisory Activities** | **Economic and Sector Work: Sector or Thematic Reports Technical Assistance: Implementation /Advisory Reports, Event Proceedings Documents** |
| Rwanda | Renewable Energy Policy and Strategy |

## ENERGY EFFICIENT CITIES INITIATIVE (EECI)

| | |
|---|---|
| **Analytical & Advisory Activities** | **Economic and Sector Work: Sector or Thematic Reports Technical Assistance: Implementation /Advisory Reports, Event Proceedings Documents** |
| Belarus | Republic of Belarus Biomass-based District Heating |
| Brazil | Debates Sobre Logística Urbana Brasileira - Boas Práticas (Brazil Green Freight Logistics) |
| Brazil | Debates Sobre Logística Urbana Brasileira - Grupos Focais (Brazil Green Freight Logistics) |
| Brazil | O Estágio Atual da Logística Urbana (Brazil Green Freight Logistics) |
| China | Improving Energy Efficiency in Public Institutions |
| Egypt | Institutional Framework for Implementation of Energy Efficiency in Egypt |
| Global | Public Procurement of Energy Efficient Products: Lessons from Around the World |
| Global | Sustainable Energy for All Global Tracking Framework (Energy Efficiency chapter) |
| Turkey | Facilitating Small- and Medium-Enterprises Energy Efficiency Financing in Turkey |
| Uzbekistan | Sourcebook for Strategic Development of Industrial Energy Efficiency in Uzbekistan |
| **Knowledge Products** | **Toolkits, Operational Guides, Models, Handbooks, Databases, Internal and External Trainings, Forums, and Workshops** |
| Database | Open Datasets for Sao Paulo's SPTransport |
| Database | Open, Comparable, and Reliable Data of Transport Supply for Mexico |
| Database/Online Portal | Online Data Observatory – Center of Urban Logistics of Brazil (Brazil Green Freight Logistics) |

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## ENERGY EFFICIENT CITIES INITIATIVE (EECI) *(continued)*

| | |
|---|---|
| Financial Model | Energy Efficiency Screening Calculator (for Facilitating SME Energy Efficiency Financing in Turkey) |
| Forum | Incentives for Scaling Up Energy Efficiency: Are They Necessary? (SDN Forum 2013, Washington DC, Feb 2013) |
| Symposium | 6th Urban Research and Knowledge Symposium (Barcelona, Spain, Oct 2012) |
| Toolkit | Data Analysis Tool for Improved Targeting of Urban Transport Interventions |
| Toolkit | Toolkit for Training Coordinators for Pilot Project for Corporate Mobility Plan (Brazil Energy Efficiency in the Urban Transport Sector) |
| Toolkit Report | TRACE Programs delivered in Brazil—Rio de Janeiro, Belo Horizonte |
| Training | TRACE Training for AusAid (Australia, Jan 2013) |
| Training | TRACE Training for EU Energy Initiative – Partnership Dialogue Facility (Washington DC, Feb 2013) |
| Training | TRACE Training for Iller Bank (Turkey, Jun 2013) |
| Training | TRACE Training for Servicios Ambientales S.A. (Washington DC, Mar 2013) |
| Web/data portal | Web-based portal for data management with visualization tool, disruption tracking management system, an open trip planner for Mexico City |
| Workshop | 13th Climate Technology Initiative Workshop (Berlin, Germany, Oct 2012) |
| Workshop | Construcción y Mantenimiento de Datos Abiertos de Transporte en la Ciudad de México (Mexico, Jun 2013) |
| Workshop | Development of Building Energy Efficiency Codes in Eastern African Countries (Kigali, Rwanda, May 2013) |
| Workshop | Financing Municipal Energy Efficiency Investment: Developing Structured Guidance for Municipal Governments Using Global Experience (Washington DC, Nov 2012) |
| Workshop | Green Transport and Energy Efficiency Initiatives - Intelligent Transport Systems (ITS) National Master Plan: Discussions about ITS Systems and Policy Development (Bogota and Washington DC, Apr 2013) |

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## ENERGY EFFICIENT CITIES INITIATIVE (EECI) *(continued)*

| | |
|---|---|
| Workshop | High-Level Action Plan and Critical Path Towards the Implementation of the Mexico City Integrated Transport System (Mexico, Jun 2013) |
| Workshop | LAC Regional Workshop on Energy Efficiency and Non-Revenue Water (Mar del Plata, Argentina, Jun 2013) |
| Workshop | Leaders in Urban Transport Planning Program (Ahmedabad, India, Jul 2012) |
| Workshop | Leaders in Urban Transport Planning Program (Beijing, China, Sep 2012) |
| Workshop | Leaders in Urban Transport Planning Program (Seoul, South Korea, Oct 2012) |
| Workshop | Leaders in Urban Transport Planning Program (Buenos Aires, Argentina, Nov 2012) |
| Workshop | Leaders in Urban Transport Planning Program (Singapore, Jan 2013) |
| Workshop | Leaders in Urban Transport Planning Program (Mexico City, Mexico, May 2013) |
| Workshop | Leaders in Urban Transport Planning Program (Marseille, France, Jun 2013) |
| Workshop | Pilot Project for Corporate Mobility Plan (Brazil Energy Efficiency in the Urban Transport Sector; Sao Paulo, Brazil, Jul 2012) |
| Workshop | Public Procurement of Energy Efficient Products: Lessons from Around the World (Washington DC, Oct 2012) |
| Workshop | TRACE Workshop (ESMAP KEF, Paris, France, Nov 2012) |

## ENERGY ASSESSMENTS AND STRATEGIES PROGRAM (EASP)

| **Analytical & Advisory Activities** | **Economic and Sector Work: Sector or Thematic Reports Technical Assistance: Implementation /Advisory Reports, Event Proceedings Documents** |
|---|---|
| Armenia | Armenia Power Sector Tariff Study |
| Bosnia and Herzegovina | Vrbas Integrated Water-Energy Study |
| Bulgaria | Options to Improve Security of Gas Supply |
| China | Capacity Building for Smart Grid Development in China |

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## ENERGY ASSESSMENTS AND STRATEGIES PROGRAM (EASP)

| | |
|---|---|
| China | Enhancing the Institutional Model for District Heating Regulation: Outside Perspectives and Suggestions |
| Global | Direct Delivery of Power Subsidy to Rural Consumers |
| Global | International Experience with Open Access to Power Grids – Case Study: Open Access to Transmission and Distribution Systems in Brazil |
| Global | International Experience with Open Access to Power Grids – Case Study: Open Access to Transmission and Distribution Systems in Turkey |
| Global | International Experience with Open Access to Power Grids – Case Study: Open Access to Transmission and Distribution Systems in the Philippines |
| Global | International Experience with Open Access to Power Grids – Case Study: Open Access to Transmission and Distribution Systems in Peru |
| Global | International Experience with Open Access to Power Grids – Open Access Component |
| Global | Key Drivers of PPPs in Electricity Generation in Developing Countries: Cross-Country Evidence of Switching Between PPP Investment in Fossil Fuel and Renewable-Based Generation |
| India | Lighting Rural India: Experience of Rural Load Segregation Schemes in States |
| India | The Indian Power Sector: A Stocktaking and Directions for the Future - Synthesis Report |
| India | The Indian Power Sector: A Stocktaking and Directions for the Future - Governance of Indian State Power Utilities: An ongoing journey |
| India | The Indian Power Sector: A Stocktaking and Directions for the Future - Beyond Crisis: Financial Performance of India's Power Sector |
| India | The Indian Power Sector: A Stocktaking and Directions for the Future - Power for All: Electricity Access Challenge in India |
| India | The Indian Power Sector: A Stocktaking and Directions for the Future - Elite Capture: Domestic Tariff Subsidies in India |
| India | The Indian Power Sector: A Stocktaking and Directions for the Future - Private Sector Participation in the Indian Power Sector: Lessons from Two Decades of Experience |

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## ENERGY ASSESSMENTS AND STRATEGIES PROGRAM (EASP) *(continued)*

| | |
|---|---|
| India | Understanding Private Sector Participation in Hydropower Development |
| LCR | Mitigating Vulnerability to High and Volatile Oil Prices : Power Sector Experience in Latin America and the Caribbean |
| MNA | Integration of Electricity Networks in the Arab World: Regional Market Structure and Design |
| Nepal | Review of Financial Restructuring Plan of Nepal Electricity Authority |
| Peru | Planeamiento Minero-Energetico: Bases Conceptuales y Propuesta de Organizacion |
| Philippines | Rural Electricity Cooperatives Reform and Restructuring |
| Tajikistan | Tajikistan's Winter Energy Crisis: Electricity Supply and Demand |
| **Knowledge Products** | **Toolkits, Operational Guides, Models, Handbooks, Databases, Internal and External Trainings, Forums, and Workshops** |
| Forum | Energy-Water-Food-Climate Change Nexus: Buzz Words or Time for Action? (SDN Forum 2013, Washington DC, Mar 2013) |
| Tool Implementation | META Tool Implementation conducted in Dominican Republic (May 2013) |
| Tool Implementation | META Tool Implementation conducted in Macedonia (Sep 2012) |
| Tool Implementation | META Tool Implementation conducted in Jamaica (Feb 2013) |
| Tool Implementation | META Tool Implementation conducted in Vietnam (Mar 2013) |
| Tool Implementation | META Tool Implementation conducted in Haiti (Apr 2013) |
| Training | META Training to AusAid (Australia, Jan 2013) |
| Workshop | Integrating Externalities Into Electricity Supply Decisions: Applications of META in the Caribbean Islands and Central America (Washington DC, Mar 2013) |

## RESULTS-BASED FINANCING (RBF)

| | |
|---|---|
| **Analytical & Advisory Activities** | **Economic and Sector Work: Sector or Thematic Reports Technical Assistance: Implementation /Advisory Reports, Event Proceedings Documents** |
| Global | Results-Based Financing in the Energy Sector: An Analytical Guide |
| **Knowledge Products** | **Toolkits, Operational Guides, Models, Handbooks, Databases, Internal and External Trainings, Forums, and Workshops** |
| Workshop | Results-Based Financing in the Energy Sector: An Analytical Guide (ESMAP KEF, Paris, France, Nov 2012) |

## IMPACT STORIES

| | |
|---|---|
| Morocco | IMPACT Issue 2: ESMAP Study Highlights Concentrated Solar Power Potential in Morocco (May 2013) |
| Peru | IMPACT Issue 4: Electrification Program Helps Boost Incomes in Rural Peru (Jun 2013) |
| Rwanda | IMPACT Issue 1: ESMAP Helps Triple Electrification Rates in Rwanda (May 2013) |
| Turkey | IMPACT Issue 3: ESMAP Tool Helps Turkish City Make Economic Growth Sustainable (Jun 2013) |

ANNEX IV

# WORLD BANK GROUP LENDING OPERATIONS INFLUENCED BY ESMAP ACTIVITIES, FY2009–13

Over the past five fiscal years (FY2009 through FY2013), ESMAP activities have contributed to the identification and design of approved World Bank Group energy lending of **$14.68 billion**. The following is a list of lending operations influenced by ESMAP activities during this period.

## WORLD BANK GROUP LENDING OPERATIONS INFLUENCED BY ESMAP ACTIVITIES, FY2009–13

| Region | Country | WBG Lending Operation |
|---|---|---|
| AFR | Africa | Regional and Domestic Power Market Development Project |
| AFR | Africa | Southern African Power Market Project (Adaptable Program Loan 1) |
| AFR | Burkina Faso | Energy Access Project |
| AFR | Cameroon | Energy Sector Development Project |
| AFR | Congo, Democratic Republic of | Forest Investment Program |
| AFR | Congo, Democratic Republic of | Growth with Governance in the Mineral Sector |
| AFR | Côte d'Ivoire, Sierra Leone Liberia, Guinea | West Africa Power Pool Adaptable Program Loan 4 (Phase 1) |
| AFR | Ghana | Ghana Energy Development and Access Project |
| AFR | Kenya | Electricity Expansion Project |
| AFR | Liberia | Liberia Electricity System Enhancement Project (Additional Financing) |
| AFR | Liberia | Lighting Lives in Liberia |
| AFR | Malawi | Energy Sector Project |
| AFR | Mali | Household Energy and Universal Access Project (Additional Financing) |
| AFR | Mali | Scaling Up Renewable Energy Program |
| AFR | Mozambique | Energy Development and Access Project |
| AFR | Mozambique | Energy Development and Access Project |
| AFR | Mozambique-Malawi | Mozambique-Malawi Transmission Interconnection Project (Adjustable Programmatic Loan 2) |
| AFR | Rwanda | Electricity Access Scale-up and Sector Wide Approach Development Project |
| AFR | Senegal | Second Sustainable and Participatory Energy Management Project (PROGEDE II) |

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## WORLD BANK GROUP LENDING OPERATIONS INFLUENCED BY ESMAP ACTIVITIES, FY2009–13 *(continued)*

| Region | Country | WBG Lending Operation |
|---|---|---|
| AFR | South Africa | Eskom Renewables Support Project |
| AFR | Tanzania | Energy Development and Access Project |
| AFR | Tanzania | Sustainable Management of Mineral Resources |
| EAP | Cambodia | Rural Electrification and Transmission Project |
| EAP | China | Beijing Rooftop Solar Photovoltaic Scale-Up (Sunshine Schools) Project |
| EAP | China | Global Environment Facility Provincial Energy Efficiency Scale-up Program |
| EAP | China | Global Environment Facility Tianjin Eco-city Project |
| EAP | China | Guangdong Green Freight Demonstration Project |
| EAP | China | Kunming Urban Rail Project |
| EAP | China | Ningbo New Countryside Development Project |
| EAP | China | Shangdong Province Energy Efficiency |
| EAP | China | Urban Scale Building Energy Efficiency and Renewable Energy Project |
| EAP | Indonesia | Climate Change Development Policy Loan I |
| EAP | Indonesia | Climate Change Development Policy Loan II |
| EAP | Indonesia | Geothermal Clean Energy Investment Project |
| EAP | Lao People's Democratic Republic | Rural Electrification Project – Phase I (Adaptable Program Loan) |
| EAP | Lao People's Democratic Republic | Rural Electrification Project – Phase II |
| EAP | Mongolia | Mining Sector Technical Assistance Project |
| EAP | Papua New Guinea | Second Mining Sector Institutional Strengthening Technical Assistance |
| EAP | Philippines | Clean Technology Fund (IFC) |
| EAP | Vietnam | Climate Change Development Policy Loan 1 |
| EAP | Vietnam | Climate Change Development Policy Loan 2 |
| EAP | Vietnam | Ho Chi Minh City Green Transport |
| EAP | Vietnam | Poverty Reduction Strategy Credit 10 |

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## WORLD BANK GROUP LENDING OPERATIONS INFLUENCED BY ESMAP ACTIVITIES, FY2009–13 *(continued)*

| Region | Country | WBG Lending Operation |
|---|---|---|
| EAP | Vietnam | Power Sector Reform (Development Policy Operation 2) |
| EAP | Vietnam | Vietnam Poverty Reduction Strategy Credit 9 |
| EAP | Vietnam | Vietnam Transmission and Distribution (Additional Financing 2) |
| ECA | Armenia | Electricity Supply Reliability Project |
| ECA | Armenia | Energy Efficiency Project |
| ECA | Georgia | First Competitiveness and Growth Development Policy Operation |
| ECA | Georgia | Second Competitiveness and Growth Development Policy Operation |
| ECA | Macedonia, former Yugoslav Republic of | Global Environment Facility Sustainable Energy Project |
| ECA | Moldova | Energy Project II (Additional Financing) |
| ECA | Poland | Energy Efficiency Development Policy Loan |
| ECA | South Eastern Europe | Energy Community of South East Europe Adaptable Program Loan |
| ECA | Turkey | Energy Community of South East Europe Adaptable Program Loan #6 |
| ECA | Turkey | Environmental Sustainability and Energy Sector (Development Policy Loan 2) |
| ECA | Turkey | Private Sector Renewable Energy and Energy Efficiency Project |
| ECA | Turkey | Private Sector Renewable Energy and Energy Efficiency Project (Additional Financing) |
| ECA | Turkey | Programmatic Electricity Sector Development Policy Loan |
| ECA | Turkey | Small- and Medium-Enterprises Energy Efficiency Project |
| ECA | Ukraine | Energy Efficiency Project |
| ECA | Ukraine | Ukraine Energy Efficiency Project |
| ECA | Uzbekistan | Energy Efficient Industrial Enterprises |

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## WORLD BANK GROUP LENDING OPERATIONS INFLUENCED BY ESMAP ACTIVITIES, FY2009–13 *(continued)*

| Region | Country | WBG Lending Operation |
|---|---|---|
| LCR | Bolivia | Decentralized Infrastructure for Rural Transformation Project |
| LCR | Brazil | Electrobras Distribution Rehabilitation Project |
| LCR | Haiti | Rebuilding Energy Infrastructure and Access Project |
| LCR | Honduras | Power Sector Efficiency Enhancement Project |
| LCR | Honduras | Scaling Up Renewable Energy Program – Honduras Investment Plan |
| LCR | Jamaica | Energy Investments and Technical Assistance |
| LCR | Mexico | Efficient Lighting and Appliances |
| LCR | Mexico | Framework for Green Growth Development Policy Loan |
| LCR | Mexico | Global Environment Facility Energy Efficient Lighting and Appliances Project |
| LCR | Mexico | Global Environment Facility Wind Umbrella Project III |
| LCR | Mexico | Low Carbon Development Policy Loan |
| LCR | Peru | First Rural Electrification Project |
| LCR | Peru | Rural Electrification Project |
| LCR | Peru | Second Rural Electrification Project |
| LCR | Uruguay | Administracion de las Obras Sanitarias del Estado (OSE) Response for Climate Change Project |
| MNA | Djibouti | Geothermal Power Generation Project |
| MNA | Egypt, Arab Republic of | Ain Sokhna Power |
| MNA | Egypt, Arab Republic of | Giza North Power Project |
| MNA | Egypt, Arab Republic of | Helwan South Power Project |
| MNA | Egypt, Arab Republic of | Kom Ombo Solar Power |
| MNA | Egypt, Arab Republic of | Wind Power Development Project |
| MNA | Morocco | Energy Sector Development Policy Loan |
| MNA | Morocco | Ouarzazate Concentrated Solar Power |
| MNA | Morocco | Urban Transport Development Policy Loan |

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## WORLD BANK GROUP LENDING OPERATIONS INFLUENCED BY ESMAP ACTIVITIES, FY2009–13 *(continued)*

| Region | Country | WBG Lending Operation |
|---|---|---|
| MNA | Tunisia | Concentrated Solar Power |
| MNA | Tunisia | Energy Efficiency and Renewable Energy Investment Project |
| MNA | Tunisia | Tunisian Electricity and Gas Company (STEG) Concentrated Solar Power |
| MNA | West Bank and Gaza | Municipal Development Program Phase I |
| SAR | Afghanistan | Power System Development Project |
| SAR | Bangladesh | Clean Air Sustainable Environment Project |
| SAR | Bangladesh | Rural Electrification and Renewable Energy Development (RERED; Additional Funding) |
| SAR | India | Coal-Fired Generation Rehabilitation (IBRD) |
| SAR | India | Coal-Fired Generation Rehabilitation (GEF) |
| SAR | India | Haryana Power System Improvement Project |
| SAR | India | IFC Loan for Maharashtra State Electricity Transmission Corporation Limited |
| SAR | Nepal | Kabeli Transmission Project |
| SAR | Pakistan | Electricity Distribution and Transmission Improvement Program Project |

**World Bank Regions** | **AFR** – Africa | **EAP** – East Asia and Pacific | **ECA** – Europe and Central Asia | **MNA** – Middle East and North Africa | **LCR** – Latin American and the Caribbean | **SAR** – South Asia

ANNEX V

# COMPLETED, ONGOING, AND NEW ACTIVITIES, FY2013

## COMPLETED ACTIVITIES

| Country/Region | Activity | Task Manager |
|---|---|---|
| **CLEAN ENERGY** | | |
| China | Capacity Building for Smart Grid Development in China | Ximing Peng |
| China | Evaluation of Incentive Mechanisms (Taxation & Pricing) for Wind Power in China | Yanqin Song |
| Global | Climate Vulnerability in the Energy Sector | Pierre Audinet |
| Indonesia | Geothermal Risk Mitigation Framework in Indonesia | Anh Nguyet Pham |
| Lebanon | Wind Power Development Study | Simon J. Stolp |
| Nigeria | Climate Change Implications for Growth in the Non-Oil Sector in Nigeria | Raffaello Cervigni |
| Turkey | National Watershed Management | Aziz Bouzaher |
| Yemen | Yemen Renewable Energy Framework | Jianping Zhao |
| **ENERGY ACCESS** | | |
| Global | Clean Cookstoves Mapping | Venkata Ramana Putti |
| Global | Gender and Energy Development Strategies Program | Venkata Ramana Putti |
| Global | Household Energy Access: Lessons Learned and Scaling Up Opportunities | Koffi Ekouevi |
| Global | Household Energy Guidance Note | Koffi Ekouevi |
| LCR | Central America Improved Cookstoves Framework | Xiaoping Wang |
| Philippines | Philippines Rural Electricity Cooperatives: Reform and Restructuring | Alan F. Townsend |
| **ENERGY EFFICIENCY** | | |
| Belarus | Biomass-based District Heating | Pekka Kalevi Salminen |
| China | Government Facilities Energy Efficiency Project | Gailius J. Draugelis |
| Egypt Arab Republic of | Energy Efficiency Strategy (Phase2) | Jianping Zhao |
| Global | Public Procurement of Energy Efficient Products | Jasneet Singh |
| Turkey | Facilitating Small- and Medium-Enterprise Financing for Energy Efficiency in Turkey | Jas Singh |

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## COMPLETED ACTIVITIES *(continued)*

| Country/Region | Activity | Task Manager |
|---|---|---|
| Uzbekistan | Energy Efficiency Strategy for Industrial Sector | Iskander Buranov |
| **ENERGY ASSESSMENTS AND STRATEGIES PROGRAMS (EASP)** | | |
| Armenia | Power Sector Tariff Study | Artur Kochnakyan |
| Bulgaria | Bulgaria Gas Dialogue | Peter Johansen |
| China | China Heat Regulation (Phase II) | Gailius J. Draugelis |
| Global | International Experience with Private Sector Participation and Open Access in Power Grids | Victor B. Loksha |
| Global | Private and Public Sector Roles in the Power Sector: Towards a New Policy Agenda | Maria Vagliasindi |
| India | Luhri Hydro Electric Project | Kwawu Mensan Gaba |
| LCR | Managing the Impact of High and Volatile Oil Prices | Rigoberto Yepez-Garcia |
| MNA | Arab World Electricity Networks Integration | Husam Mohamed Beides |
| Peru | Technical Assistance for Energy Planning in Peru | David Reinstein |
| Tajikistan | Power Supply Options Study | Daryl Fields |

## NEW ACTIVITIES

| Country/Region | Activity | Task Manager |
|---|---|---|
| **CLEAN ENERGY** | | |
| China | China Electricity Regulation to Integrate Climate Change Considerations | Ximing Peng |
| Djibouti | Geothermal Power Generation Project | Ilhem Salamon |
| Global | Assessing Climate Risks of Electricity Systems | Xiaoping Wang |
| Global | Renewable Energy Resource Mapping | Oliver Knight |
| Indonesia | Financing Options with Private Sector Participation for a Medium Hydropower Project in Outer Islands Indonesia | Anh Nguyet Pham |
| Indonesia | Geospatial Mapping and Least-Cost Electrification Planning in Indonesia | Dhruva Sahai |
| LCR | Assessment of Geothermal Potential in LCR | Migara Jayawardena |

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## NEW ACTIVITIES *(continued)*

| Country/Region | Activity | Task Manager |
|---|---|---|
| Mexico | Greening Electricity Generation | Rigoberto Yepez-Garcia |
| SA | Low Water Growth and Water Efficiency in South Asia | Charles Joseph Cormier |
| **ENERGY ACCESS** | | |
| AFR | Enhancing Regional Power Trade in Africa | Erik Magnus Fernstrom |
| Burundi | SE4ALL Technical Assistance for Burundi | Kyran O'Sullivan |
| Global | Incubating Innovation for Rural Electrification | Venkata Ramana Putti |
| Global | State of Access Report | Venkata Ramana Putti |
| Guinea | SE4ALL Technical Assistance for Guinea | Moez Cherif |
| Indonesia | Support to the Design of an Results-Based Funding Mechanism for the Implementation of the Indonesia Clean Stove Initiative | Yabei Zhang |
| Liberia | SE4ALL Technical Assistance for Liberia | Zayra Luz Gabriela Romo Mercado |
| Mozambique | SE4ALL Technical Assistance for Mozambique | Christopher Philip Trimble |
| Papua New Guinea | Support the Development of an Electrification Roll-Out Plan | Roberto Gabriel Aiello |
| Peru | Peru Second Rural Electrification | Janina Andrea Franco Salazar |
| Senegal | SE4ALL Technical Assistance for Senegal | Awa Seck |
| **ENERGY EFFICIENCY** | | |
| ECA | Energy Efficiency Scale-Up Plan in Buildings | Jas Singh |
| Ethiopia | CFL and Incandescent Lamp Recycling Operation Framework | Abdolreza B. Rezaian |
| Global | Capacity Building for Energy Efficiency Urban Transport | Om Prakash Agarwal |
| Global | Energy Efficient Urban Transport Policy Toolkit | Om Prakash Agarwal |
| Kyrgyz Republic, Tajikistan | Heating and Energy Efficiency Assessment for the Building Sector of the Kyrgyz Republic and Tajikistan | Ani Balabanyan |
| LCR | Green Transport and Energy Efficiency Initiatives | Shomik Raj Mehndiratta |
| LCR | TRACE Model in Pilot Cities in Latin America | Todd M. Johnson |

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## NEW ACTIVITIES *(continued)*

| Country/Region | Activity | Task Manager |
|---|---|---|
| LCR | LCR Regional Workshop on EE/NRW | Carmen Rosa Yee-Batista |
| Turkey | Sustainable Cities Action Plan | Stephen George Karam |
| West Bank and Gaza | Development of a Manual to Procure New Energy Efficient Water/Sewage Pumping, Street Lighting, and Public Building Services | Soraya Goga |
| **ENERGY ASSESSMENTS AND STRATEGIES PROGRAMS (EASP)** | | |
| AFR | Harnessing African Gas for African Power | David John Santley |
| AFR | Integration of Mining Sector Demand for Power Sector Development in Africa | Sudeshna Ghosh Banerjee |
| Armenia | Armenia Power Sector Policy Note | Artur Kochnakyan |
| ECA | Assessment of the Role of Glaciers in Stream Flow from the Pamir and Tien Shan Mountains | Winston Yu |
| ECA | Strategic Analysis of Water Resources Development Options in the Upper Amu Darya Basin | Sanjay Pahuja |
| Global | Economic Tradeoffs of the Water and Energy Nexus | Diego Juan Rodriguez |
| Global | Energy Subsidy Reform and Delivery: Safeguarding the Poor and Vulnerable | Sameer Shukla |
| Global | International Experience with Private Sector Participation in Power Grids | Victor B. Loksha |
| India | Institutional Strengthening of Power Utilities in North-East Region | Rohit Mittal |
| Indonesia | Financing Options with PPP for a Medium Hydro Power Project in Outer Islands | Anh Nguyet Pham |
| Iraq | Capacity Development for Electricity Sector Reform | Simon Stolp |
| Kenya | Kenya's Power Sector: Future Role of the Public and Private Sectors | Kyran O'Sullivan |
| Kyrgyz Republic | Power Sector Note | Ani Balabanyan |
| LCR | Energy Sector Diagnostics in Latin America | Migara Jayawardena |
| LCR | Introduction of Liquefied Natural Gas in Central America and the Caribbean | Rigoberto Yepez-Garcia |

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## NEW ACTIVITIES *(continued)*

| Country/Region | Activity | Task Manager |
|---|---|---|
| MNA | A Compendium on Power Sector in the MNA Region | Fowzia Hassan |
| Nicaragua | Greater Managua Water and Sanitation (PRASMA) | Lilian Pena Pereira Weiss |
| Pakistan | Pakistan Power Distribution Non-Technical Losses Reduction Strategy | Rashid Aziz |
| Sudan | Electricity Sector Strategy Note for South Sudan | Raihan Elahi |
| Yemen | Yemen Energy Sector Strategy | Jianping Zhao |
| **SIDS DOCK** | | |
| Cape Verde | Cape Verde Energy Conservation and Energy Efficiency Plan | Fabrice Karl Bertholet |
| Dominica | Geothermal Development in Dominica | Migara Jayawardena |
| LCR | Eastern Caribbean Energy Regulation Authority | Chandra Shekhar Sinha |
| Mauritius | Preparation of a Grid Code, Feed-in-Tariffs & Model Energy Supply Purchase Agreements for Renewable Energy Systems Greater than 50kW | Noreen Beg |
| Sao Tome and Principe | Power Sector Efficiency Improvement | Silvia Martinez Romero |
| Seychelles | Determination of the Grid Absorption Capacity of the Public Utilities Corporation Grid Code, Feed-in-Tariff for Renewable Energy | Silvia Martinez Romero |
| Vanuatu | Vanuatu Energy Sector Development Project | Kamleshwar Prasad Khelawan |

## ONGOING ACTIVITIES

| Country/Region | Activity | Task Manager |
|---|---|---|
| **CLEAN ENERGY** | | |
| China | Defining and Measuring Low Carbon Cities in China | Xiaodong Wang |
| Global | Clean Energy Guidebooks and Briefs | Silvia Martinez Romero |
| Global | Clean Energy Staff Training and Knowledge Platform | Silvia Martinez Romero |

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## ONGOING ACTIVITIES *(continued)*

| Country/Region | Activity | Task Manager |
|---|---|---|
| Global | Energy Sector Low Carbon Development Operational Support | Pierre Audinet |
| Global | Geothermal Scale-up Investment Plan | Pierre Audinet |
| Global | Integration of Renewable Energy Technologies in Sustainable Infrastructure | Silvia Martinez Romero |
| Global | Low Carbon Development in Power Sector | Venkata Ramana Putti |
| Global | Smart Grids Knowledge Exchange Platform | Marcelino Madrigal |
| India | Concentrated Solar Power Initiative | Ashish Khanna |
| LCR | Climate Change Auctions Best Practices | Chandra Shekhar Sinha |
| MNA | North Africa Regional CSP Scale-Up Initiative | Chandrasekar Govindarajalu |
| Tunisia | Low Carbon Action Plan for Transport Sector | Olivier P. Le Ber |
| Tunisia | Low Carbon Power Sector Strategy | Fanny Kathinka Missfeldt-Ringius |
| **ENERGY ACCESS** | | |
| AFR | AAA ESMAP Lighting Africa | Dana Rysankova |
| AFR | Africa Electrification Experience | Raluca Georgiana Golumbeanu |
| AFR | Biomass Energy Initiative for Africa (BEIA) | Juliet Pumpuni |
| AFR | Clean Cooking Initiative for Africa | Dana Rysankova |
| Ghana | Energy Sector Review | Sunil W. Mathrani |
| Global | Defining and Measuring Access to Energy | Mikul Bhatia |
| Global | Economics of Household Energy | Venkata Ramana Putti |
| Liberia | Catalyzing New and Renewable Energy in Rural Liberia | Clemencia Torres De Mastle |
| **ENERGY EFFICIENCY** | | |
| AFR | Energy Efficiency Development in African Cities | Karan Capoor |
| Brazil | Brazil Green Freight Transport | Georges Bianco Darido |
| China | Issues and Options in Monitoring, Verification, and Reporting in Energy Efficiency | Xiaodong Wang |
| Global | Making Cities More Energy Efficient | Feng Liu |

*(continued on next page)*

## ONGOING ACTIVITIES *(continued)*

| Country/Region | Activity | Task Manager |
|---|---|---|
| Global | Tool for Rapid Assessment of City Energy – Deployment and Dissemination | Pedzi Makumbe |
| Ukraine | Facilitating Commercial Municipal Energy Efficiency Finance in Ukraine | Astrid Manroth |
| **ENERGY ASSESSMENTS AND STRATEGIES PROGRAMS (EASP)** | | |
| ECA | Regional Energy Development Strategy Update | Salvador Rivera |
| Egypt, Arab Republic of | Cairo Congestion Study | Ziad Salim El Nakat |
| Egypt, Arab Republic of | Policy Note on Social Accountability in the Egypt Energy Sector | Waleed Saleh I. Alsuraih |
| Global | Direct Delivery of Power Subsidy to Rural Consumers | Mohinder P. Gulati |
| Global | Model for Electricity Technology Assessment (Deployment Phase) | Sameer Shukla |
| India | The Indian Power Sector: A Stocktaking and Directions for the Future | Sheoli Pargal |
| LCR | Impacts of High Oil Prices in Latin America | Rigoberto Yepez-Garcia |
| MNA | Synchronization of Mashreq, Turkey, and European Union Electricity Grids | Waleed Saleh I. Alsuraih |
| Morocco | Natural Gas Master Plan (Phase II) | Fanny Kathinka Missfeldt-Ringius |
| Niger | Energy Sector Assessment | Issa Diaw |
| **RESULTS-BASED FINANCING** | | |
| Global | Results-based Funding for Energy Sector Development | Oliver Knight |
| **SIDS DOCK** | | |
| Global | Small Island Developing States Revolving Fund Options Paper | Almudena Mateos Merino |
| Global | Promoting Innovation in Renewable Energy and Energy Efficiency in Small Island Developing States | Habiba Gitay |
| Global | Virtual Network to Support SIDS DOCK Platform | Ethelstan Angus Friday |

**World Bank Regions** | **AFR** – Africa | **EAP** – East Asia and Pacific | **ECA** – Europe and Central Asia | **MNA** – Middle East and North Africa | **LCR** – Latin American and the Caribbean | **SAR** – South Asia

ANNEX VI

# PUBLICATIONS, FY2013

| ISBN, Pub. No., Or Project ID | Country/ Region | Title | Author/PTL/Program |
|---|---|---|---|
| Brochure | AFR | ACCES \| Africa Clean Cooking Energy Solutions Initiative | Srilata Kammila |
| P129287 | Armenia | Power Sector Tariff Study | Artur Kochnakyan, Ani Balabanyan, Pedro Antmann, Caterina Ruggeri, Laderchi, Anne Oliver, Lauren Pierce, Denzel Hankinson |
| P120664 | China | Enhancing The Institutional Model for District Heating Regulation: Outside Perspectives and Suggestions (English & Chinese) | Gailius Draugelis, Beatriz Arizu de Jablonski, Bernd Kalkum, Fernando Lecaros, Valdas Lukoševičius, Emmanuel Py |
| P117407 | Egypt | Helwan South 3x650 MWe Gas-Fired Steam Power Project (10 vols.) | Waleed Saleh I. Alsuraih |
| Administrative Report | Global | 2012 ESMAP Annual Report | Nick Keyes |
| P114371 ESMAP Knowledge Series 012/12 | Global | Commercial Woodfuel Production \| Experience from Three Locally Controlled Wood Production Models | Rogerio Carneiro de Miranda, Steve SEpp (ECO-CONSULT), Elaine Ceccon (UNAM); edited by Matthew Owen (consultant) |
| P125368 | Global | Connecting to Compete – Trade Logistics in the Global Economy: The Logistics Performance Index and its Indicators | Jean-Rancois Arvis, Monica Alina Mustra, Lauri Ojala (consultant), Ben Shepherd, Daniel Saslavsky |
| Administrative Report | Global | ESMAP FY2014–16 Business Plan | Rohit Khanna |
| P127172 ESMAP Technical Report 002/12 | Global | Geothermal Handbook \| Planning and Financing Power Generation | Magnus Gehringer, Victor Loksha |
| P1230004 ESMAP Knowledge Series 014/13 | Global | Integrating Gender Considerations into Energy Operations | Wendy Hughes, Vanessa Lopes Janik, Yvette Bossman |

*(continued on next page)*

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| ISBN, Pub. No., Or Project ID | Country/ Region | Title | Author/PTL/Program |
|---|---|---|---|
| P27168<br>ESMAP Knowledge Series 011/12 | Global | Planning for a Low Carbon Future \| Lessons Learned from Seven Country Studies | Oliver Knight |
| P127039<br>ESMAP Technical Report 003/12 | Global | Public Procurement of Energy Efficient Products \| Lessons from Around the World | Jas Singh, Alicia Culver, Melis Bitlis |
| P127532<br>ESMAP Technical Report 004/13 | Global | Results-Based Financing in the Energy Sector \| An Analytical Guide | Vivid Economics for Oliver Knight |
| P120423<br>WB Study<br>978–0-8213–9762–6 | Global | Revisiting Public-Private Partnerships in the Power Sector | Maria Vagliasindi |
| P127219<br>ESMAP brochure | Global | Sustainable Household Energy for All | |
| Joint Study | Global | Global Tracking Framework | Banerjee, Sudeshna Ghosh; Bhatia, Mikul; Azuela, Gabriela Elizondo; Jaques, Ivan; Sarkar, Ashok; Portale, Elisa; Bushueva, Irina; Angelou, Nicolina; Inon, Javier Gustavo |
| P110853 | Jordan | Carbon Capture and Storage Capacity Building Technical Assistance | Husam Beides |
| P119291<br>WB Directions in Development<br>978–0-8213–9577–6 | LCR | Mitigating Vulnerability to High and Volatile Oil Prices: Power Sector Experience in Latin America and the Caribbean | Rigoberto Ariel Yépez-García, Julie Dana |
| P124390 | LCR | What have we learned about household biomass cooking in Central America? (English & Spanish) | Xiaoping Wang, Janina Franco, Omar R. Masera, Karin Troncoso, Mara X. Rivera |
| P113858 | Lebanon | Large-scale Solar Water Heater Market Development Program in Lebanon | Simon Stolp |
| P113858 | Lebanon | Thermal Standards for Buildings: Review of the Implementation Plan | Simon Stolp |

*(continued on next page)*

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| ISBN, Pub. No., Or Project ID | Country/ Region | Title | Author/PTL/Program |
|---|---|---|---|
| P117818<br>WB Study<br>978–0-8213–9973–6 | Nigeria | Assessing Low-Carbon Development in Nigeria \| An Analysis in Four Sections | Raffaello Cervigni, John Allen Rogers, Irina Dvorak (editors) |
| P117818<br>WB Directions in Development<br>978–0-8213–9925–5 | Nigeria | Low-Carbon Development: Opportunities for Nigeria | Raffaello Cervingni, John Allen Rogers, Max Herion (editors) |
| P117818 | Nigeria | Toward Climate-Resilient Development in Nigeria | Raffaello Cervingni, John Allen Rogers, Max Herion (editors) |
| P111567<br>ESMAP Knowledge Series 013/12 | Rwanda | Rwanda \| Extending Access to Energy: Lessons from a Sector-Wide Approach | Arun Sanghvi (consultant), Ben Gerrtsen (Castalia Strategic Advisors) |
| P129244 | Turkey | Sample Guidelines \| Cumulative Environmental Impact Assessment for Hydropower Projects in Turkey | Esra Arıkan, Gerhard Dieterle, Aziz Bouzaher, İbrahim Haluk Çeribaşı (consultant, editor), Dündar Emre Kaya (consultant, editor), Shinya Nishimura, Ülker Karamullaoğlu, Bilgen Kahraman |

## PEER-REVIEWED PAPERS SUPPORTED BY ESMAP


Golumbeanu, Raluca, & Barnes, Douglas. (2013). *Connection Charges And Electricity Access in Sub-Saharan Africa*. Washington, DC: The World Bank.

Khandker, Shahidur R., Samad, Hussain A., Ali, Rubaba; & Barnes, Douglas F. (2012). *Are the Energy Poor also Income Poor? Evidence from India. Energy Policy,47*: 1–12.

Song, Yanqin, & Berrah, Noureddine. (2013). *China: West or East Wind, Getting the Incentives Right*. Washington, DC: The World Bank.

Sustainable Energy Department (SEG)/World Bank – IEA. (2013). *Global Tracking Framework Report*.

Troccoli, A., Audinet, P., Bonelli, P. et al. (2013). *Promoting New Links between Energy and Meteorology*. *Bulletin of the American Meteorology Society, 94* (4): ES36–40.

# ACRONYMS

| | |
|---|---|
| ABG | Annual Block Grant |
| ACCES | Africa Clean Cooking Energy Solutions initiative |
| ADB | Asian Development Bank |
| AEI | Africa Electrification Initiative |
| AFD | Agence Française de Dévelopement |
| AfDB | African Development Bank |
| AFREA | Africa Renewable Energy and Access Program |
| AOSIS | Alliance of Small Island States |
| ASTAE | Asia Sustainable and Alternative Energy Program |
| BEIA | Biomass Energy Initiative for Africa |
| CA | Cities Alliance |
| CEETI | City Energy Efficiency Transformation Initiative |
| CEIA | Cumulative Environmental Impact Assessment |
| CEIF | Clean Energy Investment Framework |
| CIF | Climate Investment Funds |
| CFL | compact florescent lamp |
| CO2 | carbon dioxide |
| CG | Consultative Group |
| CSP | Concentrated Solar Power |
| DOE | Department of Energy |
| DKK | Danish krone |
| DRC | Democratic Republic of Congo |
| EASP | Energy Assessments and Strategies Program |
| EC | electricity cooperatives |
| EDD | Electricité de Djibouti |
| EECI | Energy Efficient Cities Initiative |
| EFFECT | Energy Forecasting Framework and Emissions Consensus Tool |
| EEUCPRA | Egyptian Electric Utility and Consumer Protection Regulatory Agency |

| | |
|---|---|
| EIA | Environmental Impact Assessment |
| ESMAP | Energy Sector Management Assistance Program |
| ESW | Economic and Sector Work |
| EU | European Union |
| EUEI PDF | EU Energy Initiative Partnership Dialogue Facility |
| GACC | Global Alliance for Clean Cookstoves |
| GDP | Gross Domestic Product |
| GEF | Global Environment Facility |
| GHG | greenhouse gas |
| GGDP | Global Geothermal Development Plan |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit |
| GREIN | Global Renewable Energy Islands Network |
| GTFS | General Transit Feed Specification |
| GW | gigawatt |
| GWh | gigawatt hour |
| HESCO | Hyderabad Electricity Supply Corporation |
| IDB | Inter-American Development Bank |
| IDA | International Development Association |
| IEA | International Energy Agency |
| IEC | International Electrochemical Commission |
| IFC | International Finance Corporation |
| IRENA | International Renewable Energy Agency |
| JPO | Junior Professional Officer |
| KEF | Knowledge Exchange Forum |
| LED | Light-Emitting Diode |
| LG-QTM | Lighting Global Quality Test Method |
| M&E | Monitoring and Evaluation |
| MACTool | Marginal Abatement Cost Tool |
| META | Model for Electricity Technology Assessment |
| MOHURD | Ministry of Housing and Urban and Rural Development (China) |
| MDTF | Multi-Donor Trust Fund |
| MW | megawatt |
| OSE | Obras Sanitarias del Estado (Uruguay) |
| OECD | Organisation for Economic Co-operation and Development |
| PforR | Program-for-Results |
| PPF | Project Preparation Facility |
| PPP | Public-Private Partnerships |
| PSRC | Public Services Regulatory Commission |
| PV | photovoltaic |
| RBA | Results-Based Aid |
| RBF | Results-Based Financing |
| RE | renewable energy |
| REA | Rural Energy Agency |
| REEP | Renewable Energy Electrification Program |
| SDN | Sustainable Development Network |
| SE4ALL | Sustainable Energy for All |
| SETRAVI | La Secretaría de Transportes y Vialidad (Mexico) |
| SIDS | Small Island Developing States |
| SME | Small and Medium Enterprise |
| SREP | Scaling-up Renewable Energy Program |
| SWAPs | Sector Wide Approaches |
| TA | Technical Assistance |

| | |
|---|---|
| TAG | Technical Advisory Group |
| TRACE | Tool for Rapid Assessment of City Energy |
| UNDP | United Nations Development Program |
| WBG | World Bank Group |
| WHO | World Health Organization |

## WORLD BANK REGIONS

AFR – Africa
EAP – East Asia and Pacific
ECA – Europe and Central Asia
MNA – Middle East and North Africa
LCR – Latin America and the Caribbean
SAR – South Asia

All dollar figures ($), unless otherwise specified, are in United States dollars.

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