

The World Bank

**Asia Sustainable and  
Alternative Energy Program  
ASTAE**

Annual Status Report 19  
Fiscal Year 2011  
July 1, 2010 – June 30, 2011



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Development/The World Bank Group  
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First printing: April 2012

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## Acronyms, Abbreviations, and Units of Measure

ASTAE	Asia Sustainable and Alternative Energy Program	MDTF	Multi-donor trust fund
BETF	Bank-executed trust fund	MEMR	Ministry of Energy and Mineral Resources
BNPP	Bank-Netherlands Partnership Program	MOIT	Ministry of Industry and Transportation
CIDA	Canada International Development Agency	MW	Megawatt
CO <sub>2</sub>	Carbon dioxide	PBS	Palli Bidyuit Samity
CRÉSP	China Renewable Energy Scale-Up Program	PDR	(Lao) People's Democratic Republic
CTF	Clean Technology Fund	PGE	Pertamina Geothermal Energy
DFID	Department for International Development (UK)	PLN	Perusahaan Listrik Negara
DSM	Demand-side management	PV	Photovoltaic(s)
EAP	East Asia and Pacific Region	RE	Rural electrification
EIA	Energy Information Administration	REDP	(Vietnam) Renewable Energy Development Program
EASIN	World Bank East Asia and Pacific Infrastructure Unit	RETF	Recipient-executed trust fund
EE	Energy efficiency	SAR	South Asia Region
EIA	Energy Information Administration (U.S. Department of Energy)	Sida	Swedish International Development Agency
ESMAP	Energy Sector Management Assistance Program	SIEA	Solomon Island Electricity Authority
FY	Fiscal year	SKr	Swedish krona
GDP	Gross domestic product	SMEs	Small and medium enterprises
GE	Global Environment Facility Grant (WB internal abbreviation)	t	Ton (metric)
GEF	Global Environment Facility	TA	Technical assistance
GWh	Gigawatt-hour	TF	Trust fund
IBRD	International Bank for Reconstruction and Development	TRHDP	Tina River Hydropower Development Project
IDA	International Development Association	TWh	Terawatt-hour
IEA	International Energy Agency	W	Watt
IS	Improved services		
km	Kilometer		
KP	Knowledge products (WB internal abbreviation)		
kWh	Kilowatt-hour		





THE GENEROUS  
FUNDING PROVIDED BY  
THE NETHERLANDS AND  
SWEDEN WAS SUCCESS-  
FULLY DISBURSED TO  
BENEFIT 14 ASIAN CLIENT  
COUNTRIES DURING THE  
2007-11 BUSINESS PLAN  
PERIOD.

## Foreword

THIS TRANSITION PERIOD (2011–12) COINCIDED WITH NEW AND REEMERGING TRENDS AND INTERESTS, SUCH AS GREEN GROWTH, ENERGY ACCESS, REGIONAL AND CROSS-SECTORAL COOPERATION, AND THE INCREASING DEMAND FOR ASTAE’S SUPPORT IN SOUTH ASIA.

In fiscal 2011, ASTAE focused on completing the activities under the FY2007–11 business plan and on preparing the FY2012–15 business plan. This transition period coincided with new and reemerging trends and interests, such as green growth, energy access, regional and cross-sectoral cooperation, and the increasing demand for ASTAE’s support in South Asia. ASTAE is well positioned to accommodate these trends and interests in its new business plan.

The generous funding provided by the Netherlands and Sweden was successfully disbursed to benefit 14 Asian client countries during the 2007–11 business plan period. Each of the targeted indicators ASTAE pledged to meet for the business plan period was surpassed. Testimonials from Task Team Leaders for some of the ASTAE-supported activities are found in this annual report.

We are extremely grateful for the support provided by the Netherlands and Sweden, which assists ASTAE in its efforts toward poverty reduction through the promotion of sustainable and alternative energy in the Asia and Pacific region. We look forward to continuing cooperation with the Netherlands and Sweden and would welcome other donors who wish to join us in pursuing our common objective.

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ASTAE Program Manager/Sector Manager  
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Sustainable Development Department  
East Asia and Pacific Region  
The World Bank



**ASTAE PROVIDED  
FUNDING FOR 22  
ACTIVITIES IN 11  
COUNTRIES, ENSURING  
A DIVERSE RANGE OF  
ACTIVITIES AND  
RECIPIENT COUNTRIES.**



## Executive Summary *ASTAE At A Glance*

CREATED IN 1992, THE ASIA SUSTAINABLE AND ALTERNATIVE ENERGY PROGRAM (ASTAE) HAS BEEN INSTRUMENTAL IN MOVING THE WORLD BANK EAST ASIA AND PACIFIC REGION PORTFOLIO TOWARD SUSTAINABLE ENERGY. EMBEDDED IN A REGIONAL UNIT TO MAXIMIZE ITS LEVERAGE AND OPERATIONAL IMPACT, THE PROGRAM COVERS EAST AND SOUTH ASIA CLIENT COUNTRIES.

ASTAE works in close cooperation with the Energy Sector Management Assistance Program (ESMAP) and other World Bank Trust Funds.

The ASTAE program rests on three pillars:

- renewable energy,
- energy efficiency, and
- access to energy.

ASTAE's progress is measured by five impact indicators:

- new MW and GWh of renewable energy,
- GWh avoided through energy efficiency,
- number of household connections to improved energy sources,
- avoided CO<sub>2</sub> emissions, and
- number of countries in which activities are conducted.

ASTAE funds Bank-executed activities and will soon fund recipient-executed activities.

Current donor countries are the Netherlands and Sweden. Past donors include Australia, Canada, Finland, Japan, Switzerland, the United Kingdom, and the United States.

## ASTAE-SUPPORTED ACTIVITIES IN FISCAL 2011

Fiscal year 2011 was the final year of the FY2007–11 business plan period. Therefore, this report reviews both fiscal 2011 and the entire business plan period that is now drawing to a close. Most of the 22 ASTAE-supported activities were winding down in fiscal 2011. At the same time, the South Asia Region's (SAR's) renewed interest in ASTAE support was reflected in the activities undertaken this year and that will continue to increase in the next business plan period.

### Overview of ASTAE

The Asia Sustainable and Alternative Energy Program (ASTAE) was created in 1992 as a global partnership program. Its mandate—then and now—is to scale up the use of sustainable energy options in Asia to reduce energy poverty and protect the environment. Achievement of this objective is built on promoting ASTAE's three pillars for sustainable development: renewable energy, energy efficiency, and access to energy.

The program has been instrumental in increasing the share of sustainable energy projects in the World Bank energy portfolio in Asia; it has been especially successful in the East Asia and Pacific Region (EAP). Today, ASTAE operates in client countries in the EAP, and its engagement in the SAR is increasing. ASTAE is focused on downstream and operations-oriented activities that directly support and enhance World Bank lending projects related to the three ASTAE pillars.

ASTAE's objectives, history, delivery mechanism, indicators, and targets are described in chapter 1.

### Overview of Disbursements in Fiscal 2011

During fiscal 2011, ASTAE disbursed US\$2,603,947, a 28 percent increase from the previous year, which enabled the final disbursement of 99.8 percent of the budget available under the fiscal 2007–11 business plan period. In fiscal 2011, ASTAE provided funding for 22 activities in 11 countries, ensuring a diverse range of activities and recipient countries.

ASTAE disbursed US\$2,422,600 toward project implementation in fiscal 2011, or 91 percent of its total disbursements; the remainder of the disbursed budget covered administrative and reporting costs. Disbursements reflected a good balance of activities among all three pillars, with slightly more emphasis on renewable energy and access to energy (44 percent and 32 percent of disbursements, respectively).

In fiscal 2011, ASTAE remained focused on priority countries,

with 63 percent of its allocations going to Vietnam, Indonesia, and China. Vietnam received the most funding—US\$857,887, or 35 percent of total activity-related disbursements.

Activities in the SAR continued to increase, occurring in two countries and accounting for 13 percent of total expenditure. Regional activities that benefit several countries decreased in fiscal 2011 but remained significant at 9 percent of disbursements. Small countries were not overlooked: Pacific Island countries collectively received 11 percent of ASTAE funds. Details related to disbursements in fiscal 2011 are provided in chapter 2.

## PROGRAM OUTPUTS AND IMPACTS DURING THE FISCAL 2007–11 EXTENDED BUSINESS PLAN PERIOD

The ASTAE budget for the 2007–11 business plan period was US\$9,898,614, composed of the business plan endowments by the governments of the Netherlands and Sweden noted earlier, and approximately US\$0.6 million carried over from the Netherlands endowment to the previous business plan. By the end of fiscal 2011, total donor resources disbursed by ASTAE had reached 99.8 percent of the US\$9.9 million budget. A detailed analysis of the outputs and impacts achieved during the business plan period is provided in chapter 3.

### ASTAE-Supported World Bank Projects

During the five years of the FY07–11 business plan period, the US\$9.9 million donor resources disbursed by ASTAE supported 17 projects that had been presented to the World Bank Board of Executive Directors. The total lending related to these projects amounted to US\$2.2 billion, 51 percent of which was sourced from the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA), and the rest from borrowing countries' governments, other donors, and the private sector. Therefore, every dollar allocated by ASTAE leveraged US\$223 in World Bank–related loans or grants to sustainable energy.

### Indicators and Progress Compared with Business Plan Targets

ASTAE tracks a set of indicators illustrating its impact in supporting sustainable energy development. The indicators were chosen to convey the predominant trend within each pillar. For each new World Bank project that receives ASTAE support and is presented to the Board of Executive Directors, the impact indicators are accumulated throughout the business

plan period to produce the aggregated indicators summarized below.

*Indicator 1: New capacity and increased generation of renewable electricity.* By supporting projects that directly facilitate investments, ASTAE activities led to increased capacity and generation from renewable sources, primarily wind power in China and geothermal power in Indonesia. These projects, once implemented, are expected to directly install 1,030 MW of renewable energy that will generate 1,579 GWh every year—158 percent of the original ASTAE target.

*Indicator 2: Electricity savings resulting from efficiency improvements.* Annual savings estimates are calculated based on direct savings through World Bank loans. The ASTAE business plan targets for both direct and indirect annual electricity savings were exceeded. Direct savings will be 1,586 GWh annually—150 percent of target. Most results were achieved in China and Vietnam.

*Indicator 3: Households with access to modern energy services.* Access to electricity remains the major component of the indicator, but space heating in Mongolia, as well as improved cookstoves and biogas in Cambodia and Timor-Leste, were included. The largest contribution was provided by the rural electricity energy project in Vietnam.

Direct targets have been met, with ASTAE-supported World Bank projects financing improved services to 2 million households (four times the target of 500,000) and new access to modern energy services to an additional 648,450 households (130 percent of the target of 500,000).

*Indicator 4: Avoided greenhouse gas emissions.* This indicator estimates the quantity of carbon dioxide (CO<sub>2</sub>) emissions that would be avoided over 20 years (the conventional lifespan of projects or equipment) through ASTAE-supported World Bank projects. The CO<sub>2</sub> targets have been met. The direct-impact value is estimated to be 114 million tons of CO<sub>2</sub>, or 163 percent of the original target, and the indirect savings are estimated to be 1,097 million tons of CO<sub>2</sub>, or 141 percent of the target.

*Indicator 5: Countries benefiting from ASTAE support.* This indicator ensures that ASTAE resources are used in a balanced manner across all ASTAE countries, providing equal funding opportunities to large countries (China, Indonesia, and Vietnam) as well as to smaller countries (Pacific Islands). ASTAE financed activities in 14 countries in addition to many regional activities.

## ASTAE'S BUSINESS PLAN FOR FY2012–15

ASTAE will continue to evolve to accommodate the changing

needs in Asia and the Pacific region, but the basics of ASTAE's mandate and its pillars will stay the same. Building on lessons learned, ASTAE has forged a new business plan for FY2012–15, the third such business plan since ASTAE's inception. The details of the business plan are provided in chapter 4.

## Specific Objectives of the Third Phase of ASTAE

ASTAE's specific objective in its early days was to mainstream alternative energy into the World Bank's lending and grants in the EAP. In ASTAE's second phase, the objective was to scale up its activities, mainly within individual countries. In this third phase, the specific objective is to promote low-carbon, green growth, and to increase the supply of and access to sustainable energy on a regional basis. ASTAE will devote special attention to supporting the promotion of sustainable energy as part of a regionwide system to create collaborative impacts and promote increased efficiency. The increasing importance of the regional dimensions of ASTAE's mission is visible in the demand for ASTAE's long-standing experience and capability.

Promoting low-carbon, green growth calls for cross-sectoral work. Priority activities include ecologically and economically sustainable cities (which will require the integration of land use planning, transport, buildings, infrastructure services, and urban agriculture) along with rural development, for which renewable energy, food security, and water management, among others, must be coordinated.

Intra- and interregional activities will address specific issues that are best handled at the supranational level. In addition to supporting regional projects as defined under IDA guidelines, ASTAE will encourage South-South cooperation and knowledge sharing, and will continue to support the regional, cross-border, and common (or similar) challenges faced by countries in the region.

ASTAE seeks to continue its successful work in the EAP concurrently with reengaging in the SAR. Consistent with its downstream-project and program-oriented focus, it will add recipient-executed trust fund (RETF) activities to the current Bank-executed trust fund (BETF) activities. Intervention at the national level will remain the core intent, but specific attention will be paid to opportunities to scale country practices up to regional applicability. At the same time, given the growth and importance of cities and urbanization, ASTAE will also provide support at the subnational level. It will continue to seek cross-sectoral synergies whenever relevant to the ASTAE pillars, especially when they fit well with the cross-sectoral dimensions of low-carbon, green growth.



THE PROJECTS ASTAE HAS SUPPORTED TO DATE WILL PREVENT THE EMISSION OF 360 MILLION TONS OF CO<sub>2</sub> OVER THEIR 20-YEAR LIFETIMES.

1

## 1. Overview of the ASTAE Program

IN 2010, DEVELOPING COUNTRIES IN ASIA WERE HOME TO MORE THAN 3.4 BILLION PEOPLE, CLOSE TO HALF THE WORLD'S POPULATION, AND GENERATED CLOSE TO US\$10 TRILLION IN GDP, ABOUT 15 PERCENT OF THE GLOBAL TOTAL.<sup>1</sup> ALTHOUGH THIS POPULATION-WEALTH IMBALANCE REMAINS, THE EXCEPTIONAL ECONOMIC GROWTH ASIA RECORDED DURING THE TWO PAST DECADES LIFTED MILLIONS OF PEOPLE OUT OF POVERTY AND CONFIRMED THE CONTINENT AS ONE OF THE WORLD'S MAJOR ECONOMIC ENGINES ALONGSIDE EUROPE AND NORTH AMERICA.

As a consequence of this growth, fossil fuel consumption in many countries in the region has accelerated, leading to substantial growth in the carbon dioxide (CO<sub>2</sub>) emissions that make up the largest share of greenhouse gases. Yet, hundreds of millions of people in the region still lack access to modern energy services and cannot enjoy the related health, social, and economic benefits that could improve their quality of life.

### WHY ASTAE?

According to the U.S. Department of Energy's Energy Information Administration (EIA), which tracks world energy statistics, CO<sub>2</sub> emissions in Asian developing countries from consumption of energy increased 125 percent between 2000 and 2009—about four and a half times faster than the world average. Although other sources of greenhouse gas emissions contribute to the total, it is commonly acknowledged that the use of fossil-fuel-based energy remains by far the largest source of emissions. With 170 percent growth in emissions during this period, in 2007 China became the world's largest source of CO<sub>2</sub> emissions, and is now well ahead of the United States. In 2009, it emitted 7.7 billion tons—25 percent of the world's total. Today, although absolute greenhouse gas emissions in Bangladesh, India, Indonesia, Pakistan, Thailand, and Vietnam are still low, their emissions growth rates are much higher than the world average.

The growing consumption of energy is not evenly distributed among households across the world. Access to and consumption of modern energies remain very concentrated,

both among and within countries. The access challenge might seem greatest in Africa, but the sheer size of Asia's population means that it cannot be ignored. The United Nations estimates that more than half of the 1.4 billion people still without access to electricity live in developing Asia, 400 million of them in India. Similarly, more than 70 percent of the 2.3 billion people that still rely on biomass for cooking live in developing Asia. The lack of access to modern energies hinders human and economic development opportunities, puts often unsustainable pressure on local natural resources, and contributes to local and global pollution. The human cost is real: the World Health Organization estimates that 600,000 premature deaths annually are related to cooking using biomass in East Asia alone. The gender dimension of that sobering fact should also be noted because cooking-related indoor air pollution disproportionately affects women and children.

These access and consumption issues have led the world community to engage in expanding the use of renewable energies while promoting more efficient use of energy in general, and to call for universal access to modern energies. These issues constitute the three pillars upon which ASTAE builds its development work.

### Brief History, Challenges, Beneficiaries, and Donors

ASTAE was established in 1992 by international donors as a three-year pilot program with the objective of "mainstreaming" alternative energy in the World Bank's lending and technical assistance operations in the South Asia (SAR) and the East Asia and Pacific (EAP) Regions.

<sup>1</sup> Detailed economic and energy indicators for each country in which ASTAE is active are provided in appendix 1.

ASTAE grew out of the Financing Energy Services for Small Scale Energy Users Project (FINESSE), initiated in 1989 by the Energy Sector Management Assistance Program (ESMAP) and bilateral donors, including the U.S. Department of Energy, the Netherlands Directorate-General for International Cooperation, and the United Nations Development Programme. Following a joint request from Asian borrowers and donor partners, the Bank acted to implement the FINESSE recommendations by creating the Asia Alternative Energy Unit (ASTAE), as part of the Asia Technical Department, in January 1992.

ASTAE's original target was to increase the share of alternative energy in Bank lending to the power sector in Asia to 10 percent of total power sector lending. This goal was achieved during the fiscal 1997–2000 business plan period. ASTAE's life was extended by mutual agreement among the Bank and donor countries. It was restructured as a program in 1998, and was merged with the East Asia Energy and Mining Development Sector Unit, while continuing to provide support to South Asia.

### Leverage on Bank Operations

ASTAE's original task of promoting the use of alternative energy encompassed energy efficiency and renewable energy—ASTAE's two original pillars. To ensure a strong operational focus, ASTAE was embedded directly into regional operations.

ASTAE began its work by providing supplemental funding to forward-looking World Bank Task Team Leaders eager to undertake small peripheral endeavors to address alternative-energy-related issues encountered during the development of their projects. This often occurred through the addition of an alternative energy-specific component to a broader energy project. As these ASTAE-funded activities increased in number and positively affected regional development objectives, renewable-energy and energy-efficiency activities eventually became stand-alone projects instead of components of a project. These projects were often supported by Global Environment Facility (GEF) financing. ASTAE's operational success led its donors to replenish the trust fund at the end of each business plan period. Alternative energy, a fringe activity when ASTAE was created, has evolved into one of the Bank's main lending themes, exceeding 40 percent of energy commitments in fiscal 2009 and thereafter.

### Scale-Up and Expansion

In 2002, ASTAE started a scale-up phase. In addition to continuing its mission of mainstreaming alternative energy, ASTAE expanded its reach from within the World Bank to the client countries' stakeholders themselves, and broadened its

core business from alternative energy to sustainable energy by adding a third pillar—access to modern energy services—designed to address energy poverty and its impact on the environment. Scaling up also meant departing from project-to-project activities to take a more programmatic approach at the sector and country scale. During this transition, ASTAE focused primarily on the EAP.

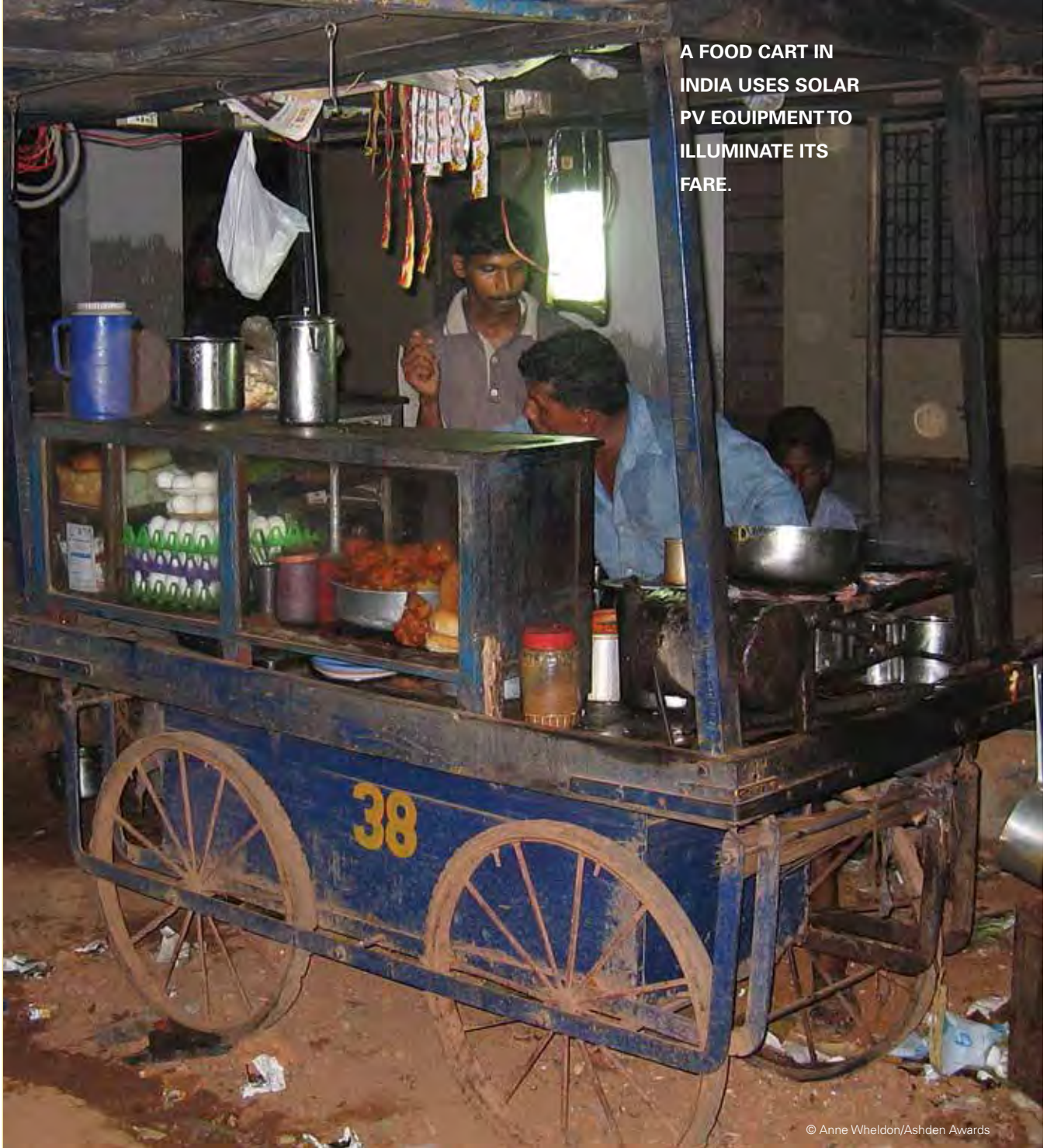
As ASTAE's funding and scope expanded, measuring its reach and impact became more challenging, and a broad set of indicators was designed to assess progress toward fulfilling its three pillars. These sustainable energy indicators—access to modern energy services, increased use of renewable energy, and improved energy efficiency (described later in this chapter)—track progress made through ASTAE activities, both as a direct result of related World Bank loans and as an indirect result of ASTAE-funded technical assistance to country stakeholders.

### Achievements and Beneficiaries

Since its inception, ASTAE has directly contributed, through its leverage of World Bank-funded projects, to installing about 1,900 MW of renewable energy—nearly the equivalent of the combined installed capacity of Cambodia, the Lao People's Democratic Republic (Lao PDR), and Mongolia, or that of Afghanistan and Nepal combined (EIA 2008). It has helped avoid the generation of about 65 TWh of electricity through energy efficiency, a little less than Vietnam's total generation in 2009. It has also contributed to providing new access to modern energy to more than 2.5 million households in Asia, or about the equivalent of the combined population of Lao PDR and Papua New Guinea (13 million people with an average household size of five).

These quantifiable achievements have resulted in substantial mitigation of global greenhouse gas emissions, as well as significant reductions in local pollutant emissions that directly and adversely affect the health of the local population. Estimates indicate that the projects ASTAE has supported to date will prevent the emission of 360 million tons of CO<sub>2</sub> over their 20-year lifetimes, equivalent to the combined emissions of Thailand and Vietnam in 2009.

Furthermore, during the scale-up phase of the past six years, ASTAE's indirect impact through its influence on country stakeholders' investment decisions has had an even wider reach. ASTAE is only one of many players at the country level, but it has contributed to concerted efforts focusing on renewable-energy development that have led to an additional 17,000 MW installed in the region, and additional potential energy savings of up to 50 TWh annually.



A FOOD CART IN INDIA USES SOLAR PV EQUIPMENT TO ILLUMINATE ITS FARE.

## ASTAE'S OBJECTIVES AND DELIVERY MECHANISMS

ASTAE's objective is to scale up the use of sustainable energy options in Asia to protect the environment and reduce energy poverty. Three pillars further define and support this objective.

### Three Pillars to Support Sustainable Development

#### A Trend of Unsustainable Development

Asia accounted for a large percentage of the growth in global demand for energy during the past two decades, with China's and India's shares of that percentage continuously expanding. The International Energy Agency (IEA) expects that the region will account for about 30 percent of global energy demand growth by 2020.

In the power sector, coal, with a share of about 75 percent, will likely continue to dominate generation, with oil and gas each accounting for about 10 percent of generation. Although China sets the pace, other countries, such as Bangladesh, India, Indonesia, and Vietnam, have rapidly rising, medium-term needs for additional generation capacity to sustain their economic growth. With the dominance of traditional fossil fuels as the primary generation option, and numerous obstacles to positioning renewable-energy sources as credible and reliable base-load substitutes, the power sector is expected to remain a large contributor to greenhouse gas emissions. Other energy subsectors, such as heating, also contribute substantially to local and global environmental issues.

Despite impressive increases in total installed generation capacity in Asia (for example, Vietnam increased its installed capacity by 6,400 MW [69 percent] between 2003 and 2008), a large segment of the population, primarily in rural and remote areas, has not benefited from this growth. The EAP's proportion of unelectrified households remains about 12 percent, a low percentage compared with Africa, but still sizable considering that it affects 170 million people. In the SAR, overall access to electricity remains lower, with about 40 percent of households across the region unelectrified and nearly 600 million people affected.

When taking into account heating fuels, whether for cooking or space heating, the numbers are an order of magnitude higher. Substantially more than 2.1 billion people in Asia depend on polluting solid cooking fuels—primarily wood, charcoal, coal, and dung. Unlike the imbalance between the EAP and the SAR for electricity, the numbers of people using solid

cooking fuels are almost evenly split between the two regions, showing that the scale and importance of the cooking fuel challenge has not yet been perceived by the authorities. The consequences are real, however, from the standpoint of health, gender, and the environment. Solid cooking fuels contribute to premature deaths, especially among women, increased local pollution, and global warming through the emission of black carbon. Moreover, population growth can stretch the demand for traditional fuels (wood, charcoal, straw) beyond their regeneration capacities.

#### Countering the Trend

ASTAE has responded to these human and environmental challenges. Its efforts to champion sustainable development in the Asian energy sector are built on three pillars.

##### *First Pillar: Renewable Energy*

Supporting energy generation growth by means of renewable-energy technologies slows the depletion of natural resources, limits global environmental damage, and can contribute to the substitution of domestic resources for imported ones. Renewable energy resources include hydroelectric, biomass, wind, geothermal, and solar energy. Several countries in the region have set ambitious targets for renewable-energy generation, but much remains to be done to reach these targets.

##### *Second Pillar: Energy Efficiency*

Given that most energy today is generated from finite fossil fuels, using less energy to reach the same desired outcome is an effective way to contribute to sustainable development. Energy intensity per unit of GDP is high in most Asian countries, indicating that room for efficiency improvement is present in all sectors of the economy. Energy-efficiency improvements can be achieved through electricity generation, energy demand management, central heating, or individual stove use. Efficiency in the energy sector is the primary target of this pillar, but ASTAE also reaches across sectors to promote this agenda, having worked in the water, buildings, and transport sectors.

##### *Third Pillar: Access to Modern Energy Services*

Access encompasses new access (for example, connecting a previously unelectrified household) and improved access (for example, construction of a biogas stove to replace charcoal for cooking). Access to modern energy can significantly improve the quality of life for end users, providing benefits such as light, heat, and power for electrical appliances and tools in a much more efficient and less polluting fashion than



the displaced resources, often at a fraction of the cost. In the past decade some countries, such as China and Vietnam, have made dramatic progress in providing electricity access to their citizens, but others lag far behind. Additionally, most countries in the region have inadequately tackled the negative impacts of traditional domestic heating fuels, whether for cooking or space heating, and have been slow to devise strategies to transition households to modern fuels or to improve the efficiency and cleanliness of traditional fuels.

To track the contributions and achievements of ASTAE-funded activities relative to each pillar, pillar-specific indicators have been defined (detailed later in this chapter). These indicators help monitor annual progress toward specific targets defined for each business plan period. Over time, ASTAE has expanded its monitoring beyond input-based indicators (linking ASTAE funding to World Bank lending) to include output-based indicators (final impacts delivered through ASTAE's lending, measured in megawatts, gigawatt-hours, or number of connections).

### Mode of Operation: Approaches, Support Mechanisms, and Structure

#### Close Collaboration with Donors

The key to ASTAE's success is its dual partnership model—partnering with World Bank task teams to undertake the operational aspects of its activities and partnering with its donors to determine and fund its strategic goals. The resulting synergy allows all parties to explore and seize opportunities to achieve the common goal of realizing ASTAE's mission. Donor countries, including the Netherlands and Sweden, Canada, Finland, Switzerland, the United Kingdom, and the United States, have over the years endowed ASTAE with block grant funding that advances the agreed-upon themes and targets. In turn, ASTAE provides Task Team Leaders with resources that are then used to support important activities in a timely and flexible way, and ultimately help demonstrate the validity and feasibility of integrating sustainable energy into the Bank's project portfolio. Because ASTAE management is located in the regional operational unit, decisions about which proposed activities to fully fund reflect the country or regional assistance strategy and the priorities of the country or regional assistance program, while at the same time aligning with donors' overarching priorities.

The ASTAE Trust Fund covers only a small portion of the costs of project preparation or technical assistance to client countries. However, the strategic use of these funds enables a far greater impact than otherwise would be possible through its influence on which projects enter the World Bank pipeline

and on the dissemination of operational experience. ASTAE also cooperates with other World Bank donor trust funds to ensure optimal use of donor funding.

#### Organized to Deliver

ASTAE's overall strategy is to focus on supporting program development and project implementation in World Bank operations, that is, "downstream" activities. The emphasis on downstream activities reinforces the effectiveness of ASTAE's three pillars of sustainable development and provides the most efficient way to achieve substantive results. Box 1-1 provides feedback from a Task Team Leader who used ASTAE funding in Vietnam.

#### BOX 1-1:

#### AN ILLUSTRATION OF ASTAE'S CONTRIBUTION TO VIETNAM

"It is fair to say that without the relatively small support from ASTAE, it would not have been possible to develop the Vietnam Renewable Energy Development Project (REDP) in its current form. ASTAE support enabled, in particular, good documentation. This will be instrumental in disseminating the financing approach adopted by REDP."



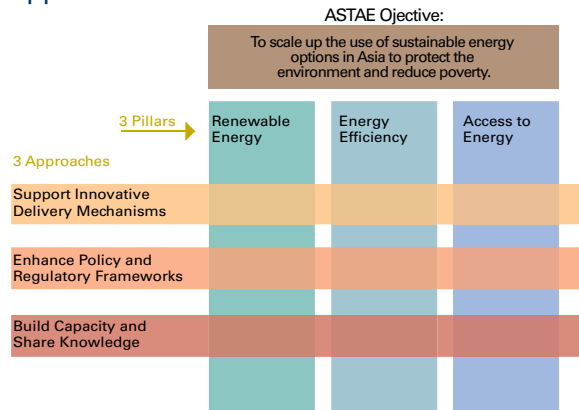
Anh Nguyet Pham, Senior Energy Specialist, Task Team Leader of projects in Vietnam and Indonesia. She is located in Indonesia.

Three approaches—innovative investment delivery mechanisms, improved policy and regulatory frameworks, and effective knowledge sharing—characterize ASTAE’s implementation of its overall strategy. ASTAE provides a wide range of support mechanisms, such as early program and project identification work, quick response and troubleshooting, project-related capacity building, and funds mobilization. These support mechanisms are provided by ASTAE staff and World Bank Task Team Leaders. Their constant interaction forms the backbone of ASTAE’s operational structure. Other important elements of the structure include the Consultative Group on World Bank Energy Trust Funds, representing donor countries, and a Technical Advisory Group that evaluates ASTAE activities annually and reports to the donor community represented by the Consultative Group.

### ASTAE Approaches

Financing for sustainable energy is available through many avenues, although the complexities of fund allocation and recipient designation for each financing option make finding the right channel a challenge. ASTAE seeks to provide practical and operational solutions to obstacles created by lack of awareness, institutional blockages, or inadequate delivery mechanisms.

**Figure 1-1: Interlinking Objective, Pillars, and Approaches**



The connections among the ASTAE objective, the three pillars, and the three approaches are shown in figure 1-1. The approaches described below apply to the business plan period that just concluded (FY2007–11). The new business plan (see chapter 4) redefines these approaches for the future.

### *Innovative Financing Delivery Mechanisms*

ASTAE helps introduce innovative financing delivery mechanisms. Financing was a major approach in ASTAE’s work during its initial years because mechanisms designed for conventional energy investments did not fit the needs of ASTAE’s intervention areas and had to be adapted. As sustainable energy projects became more mainstream, related markets matured and projects became more complex and sophisticated. ASTAE continues to provide innovative financing delivery mechanisms, but this approach has decreased to about 15 percent of allocations in the current business plan. This approach is carried out either by supporting the design, build-up, and testing of new financing mechanisms from the start, or by introducing existing mechanisms and tailoring them to the specific context of a new host country.

Recent examples of improved financing delivery mechanisms include developing on-lending guidelines for commercial banks (for an energy-efficiency project in China), structuring on-lending funds (renewable energy in Vietnam), and transferring business models among neighboring countries (energy efficiency from China to Vietnam). Delivery mechanisms can also apply to organizational, technical, and business models that can facilitate development and scale-up of an activity (for example, a model production facility for cookstoves in Cambodia).

### *Improved Policy and Regulatory Frameworks*

ASTAE supports the development of institutional and regulatory frameworks. Allocations to this approach have grown steadily since initiation of the scale-up phase, because framework development benefits programmatic schemes that have the potential for wider applicability. Today, about 48 percent of ASTAE funding is linked to institutional and regulatory framework development that primarily supports projects with impacts that are replicable, scalable upward, and sustainable. ASTAE provides an enabling environment through improved policy, financial, and regulatory frameworks, which helps attract capital from international financial institutions, export credit agencies, and the private sector.

Recent work includes high-level policy dialogue and advisory support (geothermal energy in Indonesia, access in Timor-Leste), pricing policy and regulation (access in Mongolia), design and implementation of standards (energy efficiency in Thailand and Vietnam), and assessment of the social impacts of reform (access to electricity in India).

### ***Knowledge Sharing***

ASTAE supports capacity building and knowledge sharing. These activities are at the core of ASTAE's mission, underpinning the success and effectiveness of the previous two approaches. About 37 percent of ASTAE's allocations in the current business plan are primarily focused on knowledge sharing, and 60 percent of activities include it as a secondary dimension. As a result of its positive outcomes in project and program design, implementation, and replication, ASTAE is able to draw upon a pool of expertise and consolidate its knowledge base to provide just-in-time advice to other groups engaging in the same activities across the region. The knowledge-sharing approach can operate as a stand-alone activity or as an integral part of a project if the need for capacity building or knowledge sharing goes beyond normal project-related expectations.

Recent knowledge-sharing work includes training seminars for officials and policy makers (Bangladesh, Indonesia, Mongolia, and Thailand); workshops to share technical knowledge between countries (China and Vietnam); knowledge products, technical guides, methodologies, and atlases made available nationally and internationally; dialog facilitation with the nongovernmental organization community; and donor coordination.

### **ASTAE Support Mechanisms**

ASTAE provides depth of knowledge and flexible, just-in-time funding to shape the design of new projects and programs for success, to help implement them, or to adapt them to rapidly evolving conditions. ASTAE's presence in most Asian countries has helped enable cross-fertilization among different operations, thus developing a strategic, programmatic approach to broadening the impacts of investment projects. This cross-cutting position, in turn, has helped create enabling environments in which ASTAE shares best practices to improve institutional, policy, financial, and regulatory frameworks in recipient countries. The seven support mechanisms described below are often provided in conjunction with other partners, trust funds, and donors, so the activity benefits from the comparative advantage of each player.

#### ***1. Early Program and Project Identification Work***

Best practices and new business models for alternative energy and access deployment are still being established; ASTAE helps support the development of this global knowledge base. Renewable energy is now a feasible technology model, but best practices for alternative energy deployment are still in the early stages. Large populations in Asia remain without access to electricity, indicating that current business models for

access delivery need adjustment or improvement. Households' needs, what they can afford, and their readiness to adapt to innovative technologies may be unknown. ASTAE support to Task Team Leaders and stakeholders is critical to assessing and overcoming these barriers.

#### ***2. Program and Project Development and Implementation Work***

For especially complex or innovative projects and programs, ASTAE can provide planned or unplanned support during identification and implementation. ASTAE support is provided only when circumstances require budget or expertise above and beyond normal project funding.

#### ***3. Quick Response and Troubleshooting***

ASTAE provides just-in-time response to support the urgent needs of Task Team Leaders during project development (for example, responding to stakeholders' specific issues or identifying market segments) and supervision (for example, troubleshooting unexpected regulatory barriers). ASTAE's flexibility in taking on such issues on short notice has proved indispensable in devising and delivering solutions that prevent projects from being halted.

#### ***4. Project-Related Capacity Building***

When capacity-building needs go beyond the reasonable expectations of normal project preparation or implementation (for example, strengthening capacity of new counterparts resulting from unexpected political changes), ASTAE can assist with training programs, workshops, consensus-building conferences, twinning, study tours, and access to subject matter advisers.

#### ***5. Funds Mobilization***

ASTAE assists Task Team Leaders in mobilizing additional funds by helping to clarify funding requirements for a given sustainable energy project. Careful use of a relatively small amount of ASTAE support can persuade new partners to join, leveraging initial financing to magnify its impacts.

#### ***6. Global Knowledge Interface***

Early barriers to projects that include sustainable energy components are often lack of awareness of an alternative option or technology and lack of understanding of how the option can be implemented. Providing support to Task Team Leaders or stakeholders to raise awareness is the first step in addressing this barrier. Such support is provided upstream or midstream during the project cycle—when existing expertise is made available through ASTAE's network of

subject matter consultants—and downstream when the new information generated by the project or the ASTAE activity is analyzed, monitored, and packaged for dissemination. ASTAE's monitoring and evaluation of project or program impacts is becoming an increasingly important task.

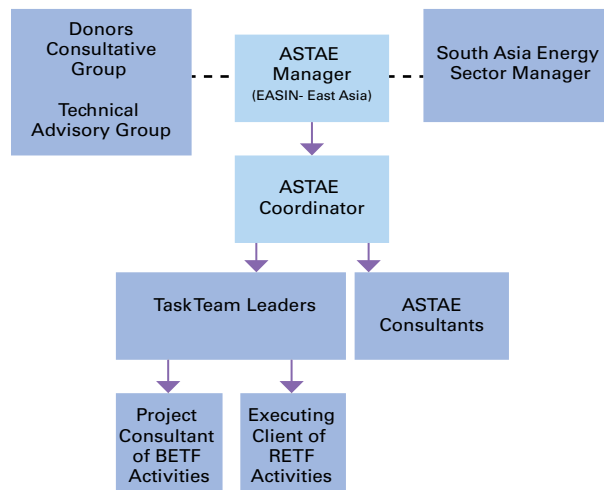
### 7. Impact Monitoring and Evaluation

ASTAE's monitoring and evaluation of project and program impacts are increasingly necessary to ensure that new information generated by projects or ASTAE activities is analyzed and packaged to be imparted to others. Its long experience in supporting sustainable energy projects has positioned ASTAE to commission ex post studies and analyses of its past projects to capture and share lessons learned that may be of great value to other countries.

### ASTAE Structure

The ASTAE management structure, shown in figure 1-2, includes both functional and hierarchical interactions. This structure may change following the conclusion of the 2007–11 extended business plan period.

Figure 1-2: ASTAE Management Structure



BETF: Bank-Executed Trust Fund  
RETF: Recipient-Executed Trust Fund

### Hierarchical Structure

Because ASTAE is embedded within the World Bank East Asia and Pacific Infrastructure Unit (EASIN), the Infrastructure

Sector Manager also serves as the ASTAE Program Manager and coordinates with the South Asia Energy Manager when needed. The ASTAE Coordinator is a World Bank staff member who provides day-to-day operational and administrative supervision of the ASTAE program, and supports Task Team Leaders, acts as a liaison with donors, and coordinates with local counterparts.

ASTAE also employs local staff in the Bank's partner-country offices to gain better insight into country-specific challenges and to support project implementation. A part-time budget administrator supports the ASTAE Coordinator in monitoring financial information.

### Functional Structure

The efforts of three types of contributor (dark blue boxes in figure 1-2) complement ASTAE's work within its structure:

- *Donors* set the agenda for the specific funding lines made available to ASTAE, and as members of the Donor Consultative Group, help the ASTAE Program Manager guide the program. They receive support from the Technical Advisory Group, which includes specialists with expertise in each ASTAE pillar. Depending on specific trust funds' agreements, donors may provide non-objection to ASTAE activities that require allocations above a predefined ceiling.
- *Task Team Leaders* are World Bank staff who identify needs for ASTAE funds to support sustainable energy in their spheres of activity, and submit requests for funding. Each proposal is evaluated on its expected contribution to ASTAE objectives, the availability of alternate funding, and the novelty or complexity of the project. Once an activity is approved, Task Team Leaders are responsible for its timely, cost-effective, and high-quality delivery. ASTAE funds are used to cover the incremental costs of developing pillar-related activities that go beyond the standard preparation and supervision costs covered by World Bank budgets.
- *Consultants* are hired by Task Team Leaders, using ASTAE-allocated funds, to carry out the necessary tasks for implementation of the ASTAE activity. Consultants may be activity-based—that is, hired for a given duration to undertake activity-specific assignments for project-related tasks—or program-based. Program-based consultants often provide more direct support to Task Team Leaders for project preparation and implementation, as well as support for the management of ASTAE-related activities. Consultants can be individuals or firms. Standard Bank procurement rules are applied to all ASTAE-funded activities.

## PERFORMANCE AND TARGETS

ASTAE provides funding allocations to Task Team Leaders who have substantiated the nature of the incremental activities they will undertake, the related costs, and the expected impacts. The activities are then carried out, yielding outputs that, whenever possible, are recorded and formatted for knowledge sharing. In addition to tracking these outputs, the progress toward ASTAE program objectives is measured against a set of indicators and targets developed to reflect the objectives outlined under the three ASTAE pillars. The collective contribution of all activities to reaching ASTAE targets is measured annually.

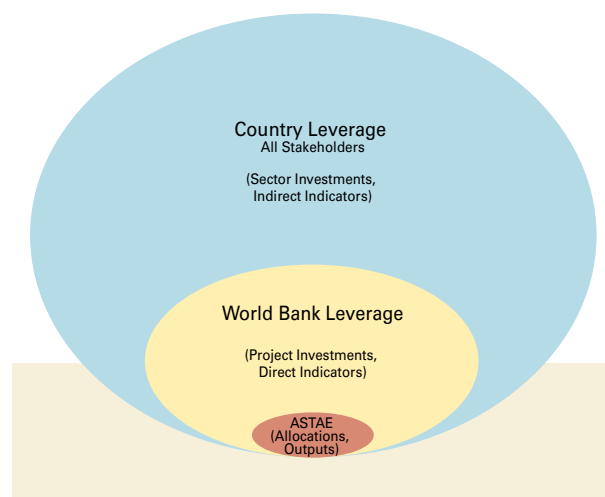
### Tools for Leverage

Budget, allocations, and outputs are the elements over which ASTAE has direct control and with which it measures its administrative effectiveness. The smallest ring of influence and impact in figure 1-3 represents this sphere.

Leverage indicators and their related targets are beyond ASTAE's direct control, but within its capacity to influence. In ASTAE's early years, leverage of World Bank operations was the chief indicator monitored. It was measured by tracking the dollar amounts of World Bank loans allocated to ASTAE pillars. Measuring ASTAE's leverage of Bank operations today consists of quantifying actual impacts in addition to lending amounts. The impact on Bank lending is considered direct, because the support to Task Team Leaders in project design and implementation directly results in improved operations and, therefore, impacts. These direct impacts are represented by the middle ring in figure 1-3.

Broader leverage, at the sector level in a country, is far more difficult to measure; direct attribution to one activity or player should be made cautiously. However, once a decision to acknowledge ASTAE's contribution is made, some formal assessment of related impacts in the field is necessary to gauge whether funds have been used efficiently. The impacts and indicators used to inform this assessment are derived from activities and programs that support enabling legislation, decrees, or behavior modification of key stakeholders that could result in large-scale effects on the three ASTAE pillars. This leverage is represented by the larger ring of influence and impact in figure 1-3.

Figure 1-3: ASTAE Influence and Impacts at Different Levels



### Budget, Allocations, and Outputs

ASTAE's budget is agreed upon with donors on a three- to four-year basis, normally covering one business plan period. ASTAE's business plan discusses its goals and focal areas, as reviewed in this chapter for the 2007–11 business plan period. ASTAE then comes to an agreement with its donors on the budget necessary to undertake its defined mission and on a set of indicators to measure its success in leveraging its funding to influence stakeholders' commitments to the ASTAE pillars. The budget allocated to ASTAE during the original 2007–09 business plan period was US\$7.4 million, complemented by additional funding that raised the budget to US\$9.9 million and permitted extension of the business plan period into fiscal 2011.

ASTAE allocations are provided to Task Team Leaders based on the merits of their proposals to undertake activities supporting ASTAE's pillars. Activity duration varies according to the nature and complexity of the tasks involved, but most are completed in one or two years. In the 2007–11 extended business plan period, ASTAE allocated an average of US\$120,000 to each of 68 activities, with most allocations ranging between US\$100,000 and US\$250,000.

ASTAE activities deliver outputs in a variety of formats, depending on the audience targeted. Outputs vary from stakeholder-specific notes (confidential policy notes, country strategies, or draft standards and labels, for instance), to broad public case making (population awareness and project information). Outputs are discussed at stakeholder meetings,

workshops, and conferences, and whenever suitable, are also published, printed, and widely distributed to a broad audience, including through ASTAE's Web site.

## Indicators and Targets

Five indicators track the impacts of ASTAE-supported activities on advancing the development of sustainable energy. Three indicators are related specifically to the renewable energy, energy efficiency, and access to modern energy services pillars; two indicators cross all pillars.

### ASTAE Sustainable Energy Indicators

ASTAE pledges to achieve specific targets for these indicators by the end of each business plan period. Target achievement is measured both as a direct result of related World Bank loans, and as indirect impacts of World Bank and ASTAE technical assistance to stakeholders in client countries.

Most activities contribute to the indicators' targets. Estimated values for direct indicators are derived directly from World Bank project information documents, project appraisal documents, and formal ASTAE proposals. Because final figures can only be known years after the end of a project, initial values are estimates. Although indirect impacts, too, are difficult to attribute, ASTAE identifies published sources (such as project information documents, project appraisal documents, and midterm reviews) that provide information on the indirect benefits of ASTAE-funded activities.

#### *Indicator 1: New capacity and increased generation of renewable electricity*

The first indicator measures the contribution of ASTAE activities to the increasing use of renewable energy in client countries. New renewable-energy generation capacity is expressed both in installed capacity, to reflect the actual investments made, and in actual energy generated, expressed in gigawatt-hours (GWh), to reflect use of the installed capacity. The relationship between a megawatt of renewable capacity installed and the GWh generated (and, therefore, the quantity of fossil fuel not used) differs from one project and one country to another because capacity factors and dispatch rules vary from one technology or country to another.

More specifically, this indicator integrates two subindicators: (a) new installed capacity in renewable energy (in megawatts, all technologies included); and (b) estimated annual quantity of electricity generated by the added renewable-energy capacity (in GWh).

In the business plan that was just finalized, a target was set for the second subindicator only: by the end of the business plan period, ASTAE-supported projects would have directly contributed to the annual generation of 1,000 GWh and indirectly contributed to the annual generation of 10,000 GWh from renewable sources.

#### *Indicator 2: Electricity savings resulting from efficiency improvements*

The contributions of ASTAE activities to saving energy through efficiency improvements are also measured. Energy-efficiency improvements can reduce peak load demand (and thus reduce or defer investments) and decrease energy consumption (less fuel used for an equivalent level of services or output provided). The electricity and heat-generation sectors recorded the most energy savings. A transformation coefficient is used to convert all savings, including of heat, into equivalent GWh of electricity. Efficiency improvements resulting in avoided capacity can provide relief to a constrained system, but a given MW of avoided capacity can result in various levels of energy savings, depending on the type of fuel used and country conditions.

More specifically, this indicator is the estimated annual quantity of electricity saved (in GWh) resulting from efficiency improvements. In the 2007–11 business plan, targets were set so that ASTAE-supported projects would contribute to continuing annual savings of 1,000 GWh directly and 10,000 GWh indirectly.

#### *Indicator 3: Households with access to modern energy services*

The third indicator measures the improvement in quality of life as households transition from traditional fuels (such as charcoal, wood, and dung) or inadequate modern fuels (such as kerosene for lighting) to modern, clean, and sustainable energy sources. When switching fuels is not possible or desirable, the indicator measures the improvement in delivery of energy services resulting from the project, such as improved quality or reliability of an electricity connection (for example, fewer blackouts and brownouts) or improved efficiency of a given activity (for example, using improved stoves to decrease wood consumption).

More specifically, this indicator comprises four subindicators: (1) the number of households receiving new access as a direct result of a Bank project,

(2) the number of households receiving improved services as a direct result of a Bank project,

(3) the number of households receiving new access as an indirect result of a Bank project, and

(4) the number of households receiving improved services as an indirect result of a Bank project.

In the current business plan, targets were set so that ASTAE-supported projects would contribute to

(1) 500,000 households receiving new access directly,

(2) 500,000 households receiving improved services directly,

(3) 50,000 households receiving new access indirectly, and

(4) 250,000 households receiving improved services indirectly.

***Indicator 4: Avoided greenhouse gas emissions***

The indicator for avoided greenhouse gas emissions spans the previous three pillar-specific indicators. Use of renewable energy and implementation of energy-efficiency measures directly decrease greenhouse gas emissions. Access to modern energy services has a more complex effect. In increasing access, some renewable fuels (wood, for example) may be displaced by fossil fuels, thus increasing emissions, but at the same time increasing caloric efficiency or improved sustainability of resources (less deforestation, for instance). The two effects may offset one another. Because of that uncertainty, the indicator for avoided greenhouse gas emissions is based primarily on the indicators for the first two pillars. Impacts measured by this indicator, as well as the energy-efficiency-related indicator, are often achieved through cross-sector work, such as when ASTAE funds projects in the water or transport sectors.

More specifically, this indicator estimates the quantity of CO<sub>2</sub> emissions avoided over 20 years (the conventional lifespan of projects or equipment) through renewable-energy generation and energy savings registered under indicators 1 and 2. In the 2007–11 business plan, targets were set so that ASTAE-supported projects would contribute to emissions avoidance over 20 years of 70 million tons of CO<sub>2</sub> directly and 780 million tons of CO<sub>2</sub> indirectly.

***Indicator 5: Countries benefiting from ASTAE support***

An indicator for equitable support was added because the four indicators above can be met most simply by concentrating ASTAE interventions in larger countries. However, ignoring small countries is inequitable and prevents regional cooperation and sustainable development in the region as a whole. In addition, in some countries small-scale project

operations rather than broader national policy programs are still the norm. Although such projects may not add much quantitatively to the first four indicators, they have large impacts on the quality of life of local populations.

The requirement for this indicator in the fiscal 2007–11 business plan was that a minimum of 10 countries receive ASTAE support.



# 2

A WOMAN FEEDS A FUEL EFFICIENT STOVE. THESE STOVES BRING WIDER BENEFITS TO WOMEN BECAUSE THEY ARE COOKING IN A SAFER ENVIRONMENT AND USING LESS TIME TO GATHER FUEL.



## 2. ASTAE-Supported Activities during Fiscal 2011: Expenditure and Country Updates

DURING FISCAL 2011, ASTAE DISBURSED US\$2,603,947, A 28 PERCENT INCREASE OVER THE PREVIOUS FISCAL YEAR, WHICH ENABLED THE FINAL DISBURSEMENT OF 99.8 PERCENT OF THE BUDGET AVAILABLE FOR THE 2007–11 BUSINESS PLAN PERIOD.

### ASTAE DISBURSEMENTS AND ACTIVITIES IN FISCAL 2011

In fiscal year 2011 (July 1, 2010, through June 30, 2011), ASTAE activities were endowed from two trust funds:

- The Government of the Netherlands Trust Fund for ASTAE (TF057088) from the Bank-Netherlands Partnership Program (BNPP); and
- The Swedish International Development Agency (Sida) Trust Fund for ASTAE (TF091618).

Fiscal 2011 was a significant year for ASTAE disbursements because the two above-mentioned trust funds were closed and made their final disbursements. In this context, all activities financed by these funds were also closed by June 30, 2011.

### Overview of Disbursements and Budget Leverage

During fiscal 2011, ASTAE disbursed US\$2,603,947, a 28 percent increase over the previous fiscal year, which enabled the final disbursement of 99.8 percent of the budget available for the 2007–11 business plan period.

#### Overview of Disbursements

In fiscal 2011, ASTAE provided funding for 22 activities in 11 countries. Four activities began and completed short-term disbursements this year, and three activities (in India, Indonesia, and Mongolia) received additional funding for subsequent phases to reinforce the successful impacts of activities begun the previous year. Two activities in Cambodia and Lao PDR had to be scaled down or cancelled as a result of the trust funds closing.

Table 2-1: Major Disbursement Categories

Disbursement category	Amount (US\$)	Percent
<b>PROJECT-ASSIGNED DISBURSEMENTS</b>		
Country-specific	2,196,836	84
Regional projects, knowledge sharing	225,764	9
<b>CROSS-CUTTING DISBURSEMENTS</b>		
Reporting	79,305	3
Administration	102,043	4
<b>TOTAL</b>	<b>2,603,947</b>	<b>100</b>

Consistent with the agreement with its donors, ASTAE funds are primarily allocated to support activities, with the remainder used for administrative and reporting purposes (table 2-1). ASTAE disbursed US\$2,422,600 for project implementation in fiscal 2011, or 93 percent of its total disbursements; the remainder of the budget was used to cover administrative and reporting costs. The next section explains these disbursements in further detail.

Administrative costs, including ASTAE staff costs and administrative support provided by World Bank employees, decreased by more than half compared with fiscal 2009, to US\$102,043. The non-activity costs are well below the ceiling agreed to with ASTAE donors; this unusually low level of administrative costs is mainly due to the closing of the trust funds partway through the fiscal year.

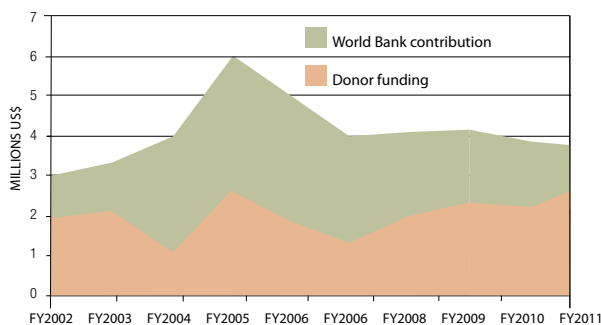
Reporting costs, which include services of the Technical Advisory Group, annual reporting, Web site management, and dissemination of reports, decreased by half to US\$79,305. These costs had increased in fiscal 2009 to reflect the reorganization of reporting outputs, including streamlining the production and publication of technical reports for activity outputs deemed to be of general interest.

### ASTAE Budget-Related Leverage

When ASTAE funds activities, the World Bank Group also contributes from its various budgetary sources to help carry out project tasks. This fund matching demonstrates the budget-related leverage that donor funding exercises in influencing World Bank projects.

In fiscal 2011, US\$2,603,947 disbursed from donor trust funds was complemented by US\$1,301,789 from the World Bank, or 67 percent and 33 percent, respectively, of the total US\$3,905,736 allocated to developing sustainable energy as a result of ASTAE-related projects. The respective World Bank and donor contributions since ASTAE's inception are provided in appendix 3.

**Figure 2-1: ASTAE Resource Mobilization, by Origin of Funding**



It should be noted, as shown in figure 2-1 and detailed in appendix 2, that both the absolute value of resource mobilization and the ratio of World Bank-to-donor contributions vary over the years. Changes over time in the pattern of donor contributions and variation in the number of sustainable energy projects in the World Bank lending pipeline or under implementation cause these fluctuations.

For example, the total ASTAE-related budget remained stable during the fiscal 2007–11 extended business plan period, at about US\$4 million per year, but World Bank budgetary support

accounted for a larger portion in fiscal 2007 (70 percent) than it did in fiscal 2011 (33 percent). There were fewer ongoing ASTAE-supported activities in fiscal 2007, and those under way had lower funding. Additionally, in fiscal 2010 and 2011, several ASTAE activities linked to knowledge sharing and cross-fertilization did not receive matching funds from the World Bank's project-related budget.

Since its inception, ASTAE leverage has resulted in doubling, to nearly US\$66 million, the budget for identification, development, and supervision allocated to sustainable energy by the World Bank in Asia. This successful leveraging highlights the value of donor funding that enables World Bank task teams to undertake challenging activities for which Bank budgets are normally very limited, but that are nonetheless necessary for identifying and preparing future sustainable energy projects or to troubleshoot problems in ongoing projects.

### Distribution of Disbursements

ASTAE allocated US\$2,422,600 to project implementation in fiscal 2011, or 93 percent of its total disbursements. To provide additional analysis of the use of donor funds, ASTAE's project-related disbursements in fiscal 2011 are broken down according to ASTAE pillars (figure 2-2), ASTAE approaches (figure 2-3), World Bank classification of activities (figure 2-4), and country (figure 2-5). This section focuses on the project-related portion of disbursements; it does not include administrative and reporting costs.

### Introductory Note to the Figures

*In figures 2-2, 2-3, and 2-4, the outer ring represents the amount disbursed; the inner ring represents the number of ASTAE activities related to an intervention pillar, ASTAE approach, or World Bank activity classification. In many instances, an ASTAE activity has several components related to various pillars or approaches, for example, a project promoting both renewable energy and access. Hence, the sum of activities may exceed the total number of activities supported by ASTAE. However, in this report, to avoid double counting of disbursements, the entire amount associated with the activity is attributed to the primary pillar or approach.*

*This somewhat distorts the reality because an ASTAE activity with a 60 percent renewable-energy component and a 40 percent access to energy component, for example, registers its funding in figure 2-2 as 100 percent renewable. However, this method still illustrates the overall strong alignment with ASTAE's core goals. In fact, the reality of ASTAE's relative disbursements according to pillar (or approach) lies somewhere*

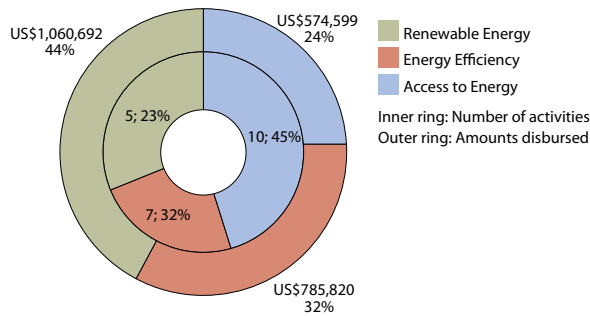
between the percentages in funding amounts (in which 100 percent is allocated to a given pillar) and the percentages in number of projects (in which each pillar mentioned in a specified activity is given the same weight).

This minor imprecision will be eliminated in the upcoming business plan period, as new and more precise disbursement tracking systems are put in place.

### Project-Related Allocations, by Pillar

ASTAE disbursements in fiscal 2011 by pillar (figure 2-2) reflect the higher allocations to renewable-energy-related activities, with 44 percent of the total, than to those in which access or energy efficiency are the primary focus. This reflects ASTAE's continued commitment to promoting alternative energy. At the same time, allocations to each pillar reinforce each other because activities often cut across pillars. This explains why more activities were connected to increasing access to modern sources of energy—this pillar is often incorporated as a subcomponent to energy-efficiency or renewable-energy activities.

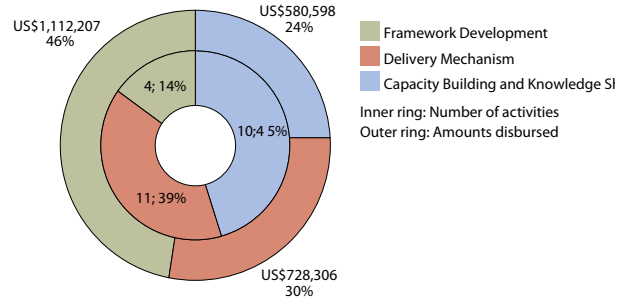
**Figure 2-2: FY2011 Disbursements by ASTAE Pillar**



### Project-Related Allocations, by Approach

Disbursements by approach (figure 2-3) shows that capacity building and knowledge sharing are well integrated in ASTAE activities, even if often as a secondary approach. The approach related to framework development continued to receive close to half of all disbursements. Framework development supports the implementation of sustainable, development-friendly policies and regulations in partner countries through specific projects to promote scaled-up efforts with lasting impacts. The relative allocation confirms ASTAE's shift in approach away from a project-based delivery mechanism (core to ASTAE's early work) toward program-focused framework development to align with the scale-up strategy of the two past business plans.

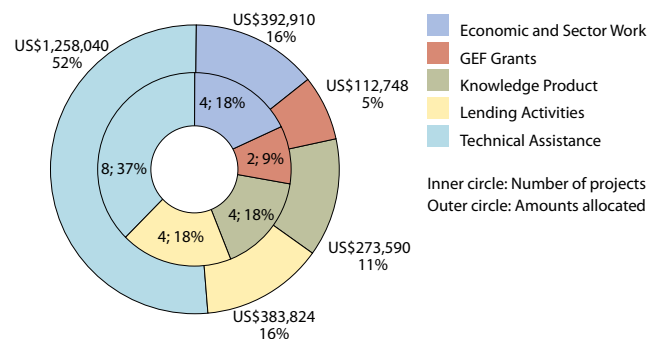
**Figure 2-3: FY2011 Disbursements by ASTAE Approach**



### Project-Related Allocations, by World Bank Line of Activity

The shift from project- to program-based activities is also reflected in the breakdown by World Bank type of activity in figure 2-4, albeit under a different label. Technical assistance supporting framework-development or capacity-building approaches, in line with the overall shift in scaling up delivery by increasing direct involvement with recipient countries' stakeholders, now accounts for more than half of disbursements. At the same time, pure lending-focused activities (preparation and supervision of GEF grants and loan projects) account for about 20 percent of disbursements. Economic and sector work, as well as knowledge products (one-quarter of disbursements), ensure that the relevant technical and operational knowledge generated by or for specific projects is available to partner countries and sufficiently disseminated to other potential beneficiaries.

**Figure 2-4: FY2011 Disbursements by World Bank Activity**



### Project-Related Allocations, by Country

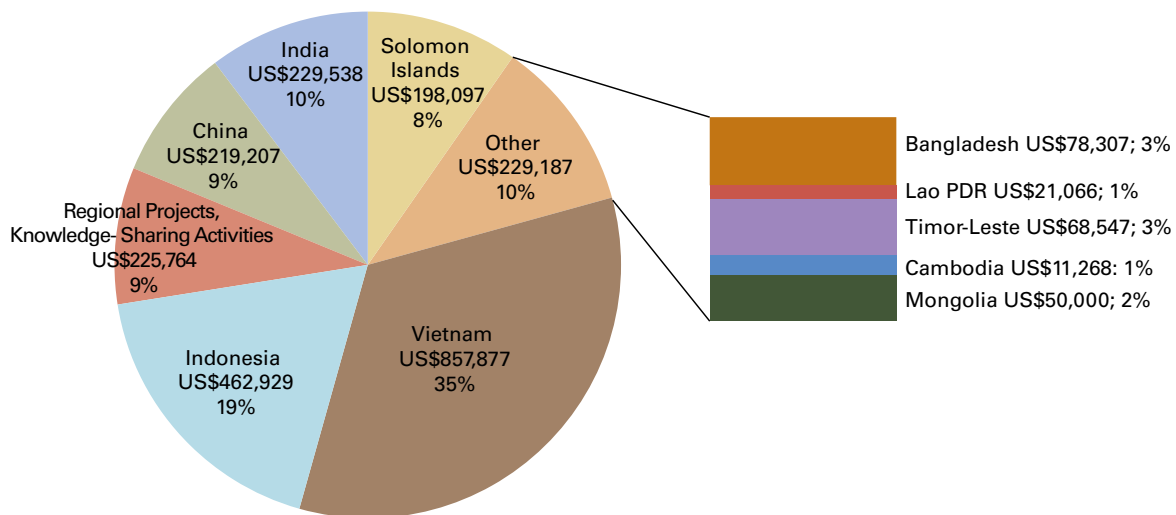
In fiscal 2011, ASTAE continued its active involvement in priority countries (figure 2-5), with 63 percent of its allocations to China, Indonesia, and Vietnam. Vietnam received the most funding—US\$857,887, or 35 percent of total activity-related disbursements, followed by Indonesia with US\$462,929, or 19 percent. China, India, and the Solomon Islands received similar levels of funding and about 9 percent of total disbursements each. The disbursements to Vietnam supported six ongoing activities, to China three activities, and to Indonesia two activities.

Activities in the South Asia Region continued to increase, occurring in two countries and reaching 13 percent of total expenditure. Activities that benefit several countries in the region, but that are not country-specific, decreased in fiscal 2011 but remained significant with 9 percent of disbursements. (The way in which ASTAE-supported activities are shared and replicated within the region is illustrated by the example in box 2-1.) Small countries were not overlooked, with Pacific Island countries collectively receiving 11 percent of ASTAE funds.

Given the diversity of countries in the South Asia and the East Asia and Pacific Regions, a map and an at-a-glance country and context summary for each of ASTAE's pillars are provided in appendix 1, including the following for each country:

- Basic information: population and GDP
- Renewable energy: capacity, generation, and market share
- Energy efficiency: energy intensity in GDP and in power generation, measured by CO<sub>2</sub> emissions
- Access: population electrified in number and rate
- Greenhouse gas emissions: annual CO<sub>2</sub> emissions and ranking.

Figure 2-5: FY2011, Disbursement by Country



**BOX 2-1:****REPLICATION OF ASTAE'S SUPPORT FOR WORLD BANK INVESTMENT ACTIVITIES IN SOUTHEAST ASIAN COUNTRIES**

Jie Tang  
Senior Energy Specialist.  
Task Team Leader of projects  
in Lao PDR, Cambodia, and  
Vietnam

"Over the past years, ASTAE financed the following activities:

- promotion of commercialization of efficient cookstoves in Cambodia,
- promotion of biodigesters for power generation in Cambodia,
- review of lessons and experiences in rural electrification in Lao PDR, and
- sharing of knowledge and experience gained through the successful Bank-supported household energy program in China with Lao PDR and Cambodia.

"ASTAE provided funding for critical studies, knowledge sharing, and consensus building with the governments and among all major stakeholders in Cambodia and Lao PDR on (i) addressing access to electricity and household energy in a sustainable way and (ii) promoting the use of renewable energy for rural electrification.

"The cookstoves and biodigester programs have great potential to be scaled up in Cambodia and to be introduced into neighboring countries like Lao PDR.

"Similar to rural electrification in Vietnam, the lessons and experiences of rural electrification in Lao PDR have been widely shared within the Bank and have the potential to benefit other developing countries across the world in their rural electrification processes.

"With ASTAE support, the knowledge and experiences gained in China for household energy were shared with Lao PDR and Cambodia, holding the promise of significant impacts on the household energy programs in these two IDA-eligible countries."

Table 2-2 provides an overview of the 22 ASTAE activities for which funds were disbursed in fiscal 2011, as well as a short description of the support mechanisms provided by ASTAE for these activities. A summary of disbursement amounts throughout the 2007–11 extended business plan period is also provided for reference.

**Table 2-2: Detail of ASTAE Activities and Disbursements, FY 2011**

ASTAE Activity		Type and details of activity	Total disbursements (US\$)	
			FY 2011	Period FY 2007–11*
<b>Period Total</b>			<b>2,603,947</b>	<b>9,879,560</b>
<b>BANGLADESH</b>			<b>78,307</b>	<b>78,307</b>
1	Rural Electrification Reform Action Plan	PE: IBRD-IDA project <ul style="list-style-type: none"> <li>• Provide technical support to the government to develop a time-bound action plan to meet the target of universal access by 2021</li> </ul>	78,307	78,307
<b>CAMBODIA</b>			<b>11,268</b>	<b>195,003</b>
2	Biodigester Private Sector Development Phases I and II	TA: Technical Assistance <ul style="list-style-type: none"> <li>• Define a service-delivery model and licensing procedures for private biodigester construction companies, support the emergence of such companies, and create a trade association</li> <li>• Under Phase II, scale up the number of companies formed and ensure their long-term viability</li> </ul>	11,268	108,090
<b>CHINA</b>			<b>219,207</b>	<b>1,059,842</b>
3	China Renewable Energy Scale-up Program (CRESP-II)	PE: IBRD-IDA project <ul style="list-style-type: none"> <li>• Provide support to project implementation unit</li> <li>• Provide support to Shanghai low carbon city</li> </ul>	58,945	58,945
4	Urban Transport Climate Change Strategy	ESW: Economic and Sector Work <ul style="list-style-type: none"> <li>• Review energy and carbon footprint of urban transport</li> <li>• Disseminate best practices for energy-efficiency and energy-security concerns in the urban transport sector</li> </ul>	112,198	240,468
5	Energy-Efficiency Financing Promotion	TA: Technical Assistance <ul style="list-style-type: none"> <li>• Draft an operations manual for IBRD loan on-lending to Chinese banks for energy-efficiency projects</li> <li>• Determine eligibility of subprojects for financing, preparation procedures and appraisal, implementation arrangements, and general terms of subloans</li> <li>• Develop a draft monitoring and reporting system</li> </ul>	46,062	95,122
<b>FIJI</b>			<b>-</b>	<b>111,472</b>
<b>INDIA</b>			<b>229,538</b>	<b>285,417</b>
6	Energy Efficiency in Small and Medium Enterprises (SMEs)	GE: GEF grant <ul style="list-style-type: none"> <li>• Raise awareness and build capacity in energy efficiency in SMEs</li> <li>• Increase capacity of local bank branches to identify and appraise energy-efficiency projects</li> </ul>	34,441	90,320
7	Electrification and Renewable Energy Study	TA: Technical Assistance <ul style="list-style-type: none"> <li>• Skill gap analysis in renewable energy in the power sector</li> <li>• Guidance note for a national action plan on rural feeder segregation</li> </ul>	195,097	195,097
<b>INDONESIA</b>			<b>462,929</b>	<b>1,042,355</b>
8	Geothermal Power Support Program	TA: Technical Assistance <ul style="list-style-type: none"> <li>• Assist in review, design, and consensus building for policy reforms in the geothermal sector</li> <li>• Enhance government's capacity to integrate Clean Development Mechanism in geothermal development</li> <li>• Assist in identifying and preparing geothermal projects to be financed by World Bank loan</li> </ul>	415,301	916,876

Table 2-2: Detail of ASTAE Activities and Disbursements, FY 2011

ASTAE Activity		Type and details of activity	Total disbursements (US\$)	
			FY 2011	Period FY 2007–11*
Period Total			2,603,947	9,879,560
9	Thousand Islands Solar Photovoltaic (PV)	PE: IBRD-IDA project • Rapid assessment of utility's capacity to implement the 1,000 islands electrification program • Inform utility of level of data information required to request World Bank support	47,629	47,629
<b>LAO PDR</b>			21,066	77,518
10	Lessons from the Lao Rural Electrification Program	KP: Knowledge Product • Identify factors that contributed to electrification successes • Advise government on next steps toward universal access	21,066	77,518
<b>MONGOLIA</b>			50,000	743,916
11	Energy Sector Project	PE: IBRD-IDA project • Efficiency improvement in the electricity distribution system • Greater awareness and capacity among stakeholders	50,000	297,737
<b>PACIFIC ISLANDS</b>			-	125,925
<b>PHILIPPINES</b>			-	98,380
<b>SOLOMON ISLANDS</b>			198,097	577,187
12	Tina River Hydropower Development Project	TA: Technical Assistance • Provide technical and methodological support to help the Solomon Islands government prepare a proposed hydropower development project	198,097	249,634
<b>THAILAND</b>			-	321,441
<b>TIMOR-LESTE</b>			68,547	521,655
13	Energy Service Delivery Project	TA: Technical Assistance • Preparation of the Rural Electrification Master Plan • Pre-investment study for project preparation	54,435	207,185
14	Rural Energy Access and Efficiency	TA: Technical Assistance • Help prepare an integrated pre-investment package with - Solar PV dissemination options - Candidate micro-hydro sites - Improved stoves models	14,112	186,518
<b>TONGA</b>			-	149,717
<b>VIETNAM</b>			857,877	1,615,408
15	Documentary on Rural Electrification	KP: Knowledge Product • Documentary on rural electrification in Vietnam prepared for television broadcasting	11,365	163,752
16	Rural Electrification Impact Studies	TA: Technical Assistance • Analysis of the impact of rural electrification using data from two field surveys conducted in 2002 and 2005 • Improvement of implementation design of rural electrification projects	49,521	149,799
17	Renewable Energy Development Project	TA: Technical Assistance • Preparation and supervision of the Vietnam Renewable Energy Development Project	193,252	609,501

Table 2-2: Detail of ASTAE Activities and Disbursements, FY 2011

ASTAE Activity		Type and details of activity	Total disbursements (US\$)	
			FY 2011	Period FY 2007–11*
<b>Period Total</b>			2,603,947	9,879,560
<b>VIETNAM</b>			857,877	1,615,408
18	Support for the Vietnam Energy Efficiency Demand Side Management program	TA: Technical Assistance <ul style="list-style-type: none"> <li>• Provide advisory assistance and capacity building to Ministry of Industry</li> <li>• Conduct workshops on business collaboration between Vietnamese and international energy supply companies (ESCOs)</li> <li>• Identify opportunities for expansion of commercial energy-efficiency business</li> </ul>	363,331	414,915
19	Rural Distribution Project	PE: IBRD-IDA project <ul style="list-style-type: none"> <li>• Support the preparation of plans for completing government of Vietnam's program for universal electrification</li> <li>• Build capacity of the power companies to act as independent participants in the power market</li> </ul>	227,251	227,251
20	System Efficiency Improvement, Equitization and Renewables	TA: Technical Assistance <ul style="list-style-type: none"> <li>• Policy and regulatory work to enable small hydro investments</li> </ul>	13,157	16,043
<b>REGIONAL PROJECTS, OUTREACH AND KNOWLEDGE SHARING</b>			225,764	975,809
21	Regional: Carbon Emission Mitigation Toolkit for Highway Construction	KP: Knowledge Product <ul style="list-style-type: none"> <li>• Analyze activities associated with design, construction, and rehabilitation of highway projects and identify those sensitive to energy consumption and carbon emission</li> <li>• Estimate carbon footprint and provide mitigation options</li> </ul>	166,630	275,015
22	Regional: East Asia Pacific Flagship Study	KP: Knowledge Product <ul style="list-style-type: none"> <li>• Analysis of regional potential of renewable energy sources and energy-efficiency improvements</li> <li>• Review of existing policies, identification of gaps</li> <li>• Recommendations for regional policy development</li> </ul>	59,647	209,616
<b>ADMINISTRATION AND REPORTING ACTIVITIES</b>			181,348	1,900,208
	Reporting Activities	<ul style="list-style-type: none"> <li>• Technical Advisory Group support</li> <li>• Printing and editing services</li> </ul>	79,305	586,378
	Administration	<ul style="list-style-type: none"> <li>• ASTAE international hires and local staff</li> <li>• Administrative and development support</li> </ul>	102,043	1,313,830

\* The table lists only activities with significant disbursements in fiscal 2011. Therefore, the total in some countries may be higher than the sum of all projects listed.





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**THE DELIVERY OF  
ACCESS TO  
ELECTRICITY BASED  
ON THE RURAL  
COOPERATIVE MODEL  
HAS BEEN A SUCCESS  
IN BANGLADESH.**

THE FOLLOWING SECTIONS HIGHLIGHT ASTAE-SUPPORTED ACTIVITIES THAT ARE EITHER NEW OR THAT RECORDED SIGNIFICANT DISBURSEMENTS IN FISCAL 2011, AS SHOWN IN TABLE 2-2. OTHER ACTIVITIES IN TABLE 2-2 WERE IN THE FINAL STAGES OF IMPLEMENTATION IN FISCAL 2011 AND HAVE BEEN REVIEWED IN PREVIOUS ASTAE ANNUAL REPORTS.

### **BANGLADESH: STRENGTHENING RURAL ELECTRIFICATION SERVICE DELIVERY**

The delivery of access to electricity based on the rural cooperative model has been a success in Bangladesh. The Rural Electrification Board (REB) and its rural cooperatives, called Palli Bidyut Samity (PBSs), have connected some 8.5 million customers to the grid. In all efficiency measures (system losses, collection efficiency, and so forth), the PBSs record much better performance than do the state-owned urban utilities. Still, only 30 percent of the population in rural areas has access to electricity. If the government's vision of universal access by 2021 is to be achieved, the REB and the PBSs need to be revamped.

Despite relatively good performance, over the years, the REB's organizational structure has deteriorated. Delays in recruitment of required manpower, interference in day-to-day management, lack of training, and circumvention of the master plan for line construction are just some examples of the organizational inefficiencies. To meet the challenges of Vision 2021, the organizational structure of the REB needs to be reformed and corresponding adjustments need to be made in its relationship with the PBSs.

Some of the changes have already begun. An organizational effectiveness study was initiated with Bank support that identified the problems and challenges in the rural electrification (RE) program in Bangladesh. As a follow-up to the study, the Bank initiated a unique process of stakeholder consultation in which an advisory team had a dialogue with REB and PBS management and staff and other stakeholders to reach agreement on the actions to be taken for addressing the problems and challenges in the RE program. Outdated recruitment policies and inadequate incentive packages contributed to a shortage of skilled staff for the program. Inadequate tariff adjustments resulted in deterioration in the financial position of the rural cooperatives.

The consultation process culminated in a workshop attended by top decision makers and other stakeholders at which it was widely acknowledged that the RE program needed major changes to meet the problems and challenges. However, it was also apparent that the parties disagreed about the course of reform. To reach a consensus on the specific action plan for RE reform, it was decided that a high-level task force should be formed.

The ASTAE-financed activities supported the government task force with technical expertise to develop a time-bound action plan to set the strategic direction so the RE program will meet the challenges of Vision 2021. Global best practices in organizational structure for rural service delivery were reviewed and their applicability determined in the country context. Recommendations were made for strengthening human resources practices and policies to attract and retain qualified skills in the RE program.

The scope of ASTAE's support was originally conceived to comprise technical assistance to the ministerial task force. However, support was extended to cover the consultations that took place before forming the ministerial task force.

The outcomes included helping to shape the government's views about the problems and solutions to strengthening RE system delivery in Bangladesh. There is now a growing consensus among the policy makers about the problems and the need to take corrective actions to address the weaknesses in Bangladesh's RE program. Although an action plan is not yet ready, the realization by the policy makers of the urgency of the problem has provided impetus for finding the right approach for strengthening RE service delivery. The Bank is continuing its dialogue with the government on the appropriate steps to be taken. The ASTAE activities helped shape the Bank's policy dialogue with the government. Future World Bank support to the sector has been made contingent upon a credible and time-bound action plan for strengthening RE service delivery.



## INDIA: RURAL FEEDER SEPARATION STUDY (PART OF THE ELECTRIFICATION AND RENEWABLE ENERGY STUDY)

In India today, electricity tariffs for farmers recoup less than 10 percent of the cost of supply. Power shortages in India have a significant impact on poor rural consumers, who are invariably linked with agricultural consumers. Unmetered agricultural connections limit monitoring of the agriculture subsidy and impede correct estimation of distribution losses. Those who gain the most from this subsidy policy are large farmers, whereas most small and marginal farmers lack access to electricity.

Rural electrification in India is being reformed in a number of states. Farmers pay almost nothing for power, so utilities limit their supply to eight hours a day. Therefore, access by nonfarm rural consumers on so-called mixed feeders, which supply both farm and nonfarm customers, is constrained to the same eight hours a day, limiting their development progress. A number of states have undertaken feeder segregation, whereby farmers are supplied eight hours of “free power,” and nonfarmers, on a separate feeder, are supplied for 24 hours—but expected to pay full published tariffs.

At the request of India’s Ministry of Power, the World Bank undertook a study of the experiences in rural feeder segregation with the objective of generalizing results for implementation of the schemes more broadly. The study focused on (i) analyzing differences in approach to rural feeder segregation across states; (ii) estimating the financial viability of the investment; (iii) evaluating socioeconomic benefits in rural areas through a primary survey; and (iv) developing a guidance note for a national action plan on rural feeder segregation. The study was mainly based on commercial and operational data collection and a desk review of experiences. Support from ASTAE was requested to conduct a consumer survey alongside the rural feeder separation study to confirm its findings and to get a qualitative and quantitative perspective on the experiences of the rural population. The ASTAE-funded activities consisted of a utility-level study in three states in India and a parallel study to assess the socioeconomic development impact on communities that had experience with feeder segregation.

The study results have shown that institutional support is crucial to the success of a feeder separation study. No baseline information had been gathered in any of the seven states. No separate department or unit had been created within the distribution company to manage the feeder separation

project. Most important, information, including socioeconomic data, needs to be tracked similarly to the way it was done in the ASTAE-supported study. A number of technical issues were also highlighted, such as overloading and burning out distribution transformers on the nonfarmer feeders attributable to very rapid load growth, and the proper approach to measuring socioeconomic impacts.

Consistent with ASTAE’s objectives, the Rural Feeder Separation Study focused on rural electrification and how to share limited power between paying and nonpaying loads. The Rural Feeder Separation report is turning out to be a crucial input to the dialogue between the Bank and the Ministry of Power.

The opportunity for replicability of this study is very high, particularly for countries with a federal decision-making structure like India’s.

## INDIA: RENEWABLE ENERGY SKILL GAPS STUDY (PART OF THE ELECTRIFICATION AND RENEWABLE ENERGY STUDY)

The government of India has proposed to add more than 100 GW of additional generation capacity in the upcoming 12th five-year plan for 2012–17, and to significantly increase the share of renewable energy relative to current levels. However, the trained manpower to make this happen is not in place, which is an important cross-sectoral issue that must be addressed if the targets are to be met. The objective of ASTAE support was to finance the skill gaps study to introduce an important missing link into the World Bank's policy dialogue with the Ministry of Power.

The components of the skill gaps study comprised identification of characteristics for leading, lagging, and average states; and selecting a representative state from each category. An analysis of manpower shortages in all aspects of the electricity value chain, especially renewable energy, was conducted. Data were especially difficult to obtain for renewable energy training programs, rates of graduation, and rates of hiring. However, documenting the numerous gaps in the government's manpower strategy to underpin the forthcoming ambitious growth targets for the sector was useful for launching a dialogue.

The study results showed that there are currently National Training Institutes in place, training people to be welders, electricians, crane operators, pipe-fitters, and other blue collar positions in the electricity value chain. However, the need for highly skilled white collar workers and work-streams, such as solar energy technology specialists, wind energy technology specialists, and others, are not being addressed. Several private training institutes have been accredited, and they are looking for public-private partnership opportunities to offset the cost of importing faculty members who will be needed to "train the trainers."

Through its focus on institutional strengthening in the power sector, and on high-quality and cost-effective outcomes—which cannot be achieved unless adequate numbers of trained people are in place—the skill gaps study meshed well with ASTAE's pillars.

Box 2-2 presents the Task Team Leader's comments on the value of ASTAE support to the Electrification and Renewable Energy Study, including the India Rural Feeder Separation Study and the Renewable Energy Skill Gaps Study



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**BOX 2-2:****ASTAE'S CONTRIBUTION TO THE ELECTRIFICATION AND RENEWABLE ENERGY STUDY**

Mohua Mukherjee, Senior Energy Specialist, Task Team Leader of the Electrification and Renewable Energy Study. She is located in Washington, DC.

“The South Asia Energy Unit of the World Bank (SASDE) has been implementing a program known as the South Asia Region’s Energy Studies Series (SARESS) since 2010. The hallmark of SARESS is flexibility, to provide just-in-time policy analysis, advisory notes, and analytical work, mainly conducted by World Bank staff who are assisted by top-level consultants in the relevant countries. The close involvement of World Bank staff ensures that the activities are demand-driven and directly relevant to the policy dialogue and day-to-day work—otherwise staff could not afford to spend time on these tasks. An additional feature agreed upon at the concept review stage for SARESS was that deliverables and outputs should be relatively short and focused, containing key messages that are easy for World Bank senior management to digest, to have the greatest chance to influence policy dialogue and country assistance design.

“ASTAE provided excellent support to SARESS, allowing the team to carry out two extremely important activities in the Indian power sector. First is the prominent work on Rural Feeder Separation in various Indian states that have experimented with this approach to improve the quality of power supply to rural households previously suffering from the consequences of free power to agriculture. Following separation of the feeders, nonagricultural rural consumers had access to power nearly 24 hours a day and paid for it accordingly; agricultural consumers—who do not pay—continued to receive their limited supply of eight hours per day for irrigation purposes. ASTAE support was used both to study the feeder separation experience and to conduct a survey of rural consumers who were receiving better power supply after feeder separation. Second, ASTAE provided excellent support to a similarly important topic through its report ‘Skill Gaps in the Indian Power Sector.’ The findings of this study allowed us to engage in important dialogue, drawing attention to this matter since the power sector is changing in scope and competing with private players. ASTAE plays a very important role in keeping us focused on being creative and innovative in matters related to rural electrification to reduce energy poverty, as well as renewable energy technologies, and energy efficiency improvements. All are key pillars in the SASDE work program and all have benefited from ASTAE support, and we hope that this support will continue.”





## INDONESIA: GEOTHERMAL POWER DEVELOPMENT PROGRAM, ADDITIONAL FINANCING

Indonesia has the world's largest geothermal potential, and the government has made it a development priority as part of its low-carbon growth strategy. Geothermal power will help Indonesia meet its growing energy demand in an environmentally sustainable manner because it is ideally suited to displace coal-based power. Despite its potential, a number of barriers limit Indonesia's prospects for scaling up development in the sector. At the government's request, the World Bank is assisting Indonesia to achieve its globally unprecedented target of developing 4,000 MW of new capacity by 2014–15. ASTAE has funded critical activities enhancing the technical assistance provided to Indonesia. The Bank's support is based on three distinct areas, for which additional ASTAE financing during fiscal 2011 covered nearly half of the total. ASTAE's financing to the Geothermal Power Development Program during the FY 2007–11 business plan period covered the following:

### Preparation of Investment Lending: Geothermal Clean Energy Investment Project

The World Bank provided loans totaling US\$300 million to Pertamina Geothermal Energy (PGE), a leading geothermal developer in Indonesia, to develop approximately 150 MW of geothermal capacity and kick-start the scale-up. It included US\$175 million from the IBRD middle-income country borrowing facility and concessionary financing from the Clean Technology Fund (CTF). The loan to PGE was the first CTF operation in East Asia. ASTAE played a critical role, along with complementary grant support directly to the client by the government of the Netherlands to help PGE prepare a number of investment projects to meet international and industry standards. As a first-time client of the World Bank, PGE also benefited from the capacity-building efforts made possible by ASTAE support. This support not only enhanced preparation of the World Bank-financed project, but improved its implementation and positioned PGE for preparation of future projects. ASTAE's assistance enabled the World Bank to provide critical input to PGE's feasibility studies, environmental and social impact assessments, drilling strategies for its steam fields, and overall capacity building of the implementing agency. It provided the incremental support necessary to carry out the due diligence for the World Bank and CTF loans. The review and guidance provided to PGE on its power purchase agreements contributed to the ultimate agreement with the

national power company on several geothermal developments, including the ones financed by the World Bank. And the review of safeguards work related to the impact of hydrogen sulfide has led to a national dialogue to address the issue on a sector-wide basis. Ultimately, ASTAE assistance to PGE will have a transformative impact by improving the prospects for success of the company's attempt to develop more than 1,000 MW of geothermal capacity, which will double Indonesia's capacity and account for a 10 percent increase in worldwide geothermal capacity.

### Implementation Support for Policy and Institutional Reforms: GEF Geothermal Power Generation Development Project

The government of Indonesia has recognized the need to address key policy and institutional barriers preventing the scaling up of geothermal development in Indonesia. The World Bank, through a GEF grant of US\$4 million, is helping to bring international expertise and experience to help the government address these critical issues, and ASTAE has played an instrumental role in supporting this effort. Initially, this included assistance to the Ministry of Energy and Mineral Resources (MEMR), the implementing agency, to procure key consultancies to help develop (i) a pricing policy to address incremental costs and risks associated with geothermal development, and (ii) transaction advisory services to help develop a credible transaction process for tendering new geothermal fields for development by the private sector in a fair and transparent manner. When the consultants were being procured, ASTAE helped the World Bank fill the void by providing direct technical assistance to MEMR for policy formulation and institutional strengthening. Once MEMR secured the services of the consultants, the World Bank, with the support of ASTAE, was able to work closely with MEMR and its consultants to provide guidance to the evolving and ongoing policy reforms. Through the use of the experts funded by ASTAE, the World Bank facilitated the completion of six geothermal power purchase agreements with the national power company, which will lead to more than 500 MW of new power generation capacity. The Bank also provided input to the evaluation of the tender process for geothermal transactions and its redesign to mobilize investments commensurate with the needs. In this effort to attract investors to Indonesia, ASTAE and the Public-Private Infrastructure Advisory Facility jointly supported the government in hosting the World Geothermal Congress, a definitive global event in the sector that is held every five years.

## Carbon Finance: Technical Assistance to Support Efforts to Address Climate Change

Geothermal is a clean renewable energy that is an ideal substitute for coal-based power generation in Indonesia, making it a vital element of the government's low-carbon growth strategy. It is also eligible for carbon off-set revenues under the Clean Development Mechanism, which can be an important source of funds to bridge the incremental costs associated with developing the sector. The World Bank helped implement the first public sector geothermal carbon finance transaction with Perusahaan Listrik Negara (PLN). With aid from ASTAE, the World Bank was able to assist the entire sector by providing technical assistance to MEMR and other stakeholders regarding ways in which they can access scaled-up carbon revenues through emerging mechanisms such as the Carbon Partnership Facility. The technical assistance included training of MEMR staff and other officials, consensus building among stakeholders, development of operational manuals that could be used to implement carbon off-set financing schemes, and options for an institutional structure for a coordinating and managing entity for such a program. Although there is considerable global uncertainty regarding the future structure of carbon markets, the assistance provided by ASTAE BNPP has positioned MEMR and the government to capitalize on emerging trends and possibilities for accessing carbon revenues to enhance the prospects for geothermal development.

ASTAE funds provided to the World Bank's geothermal support program in Indonesia has had a considerable impact and helped launch the country's ambitious geothermal program. Given the unprecedented scale-up being attempted, there is considerable further opportunity to consolidate the gains that have been achieved thus far, and apply them on a larger scale.

## INDONESIA: THOUSAND ISLANDS SOLAR PHOTOVOLTAIC (PV)

As a follow-up to the ongoing implementation of the Java Bali Power Sector Restructuring and Strengthening project and other multilateral-financed power projects concentrated on strengthening the power systems in Java, Bali, and other main islands, the government of Indonesia is now focusing on improving electricity access in the outer islands, mainly through the use of renewable energy technology. The government has embarked on a program to electrify the eastern Indonesian islands—referred to as the 1,000 Islands Electrification program—with the aim of achieving

near universal access during 2020–30. Consistent with these priorities, and in light of the state power utility PLN's regional plans and dialogue with the World Bank, the overall contours of a World Bank-financed project have been broadly identified for further detailing and preparation. PLN included the project in the 2012 government budget and requested the World Bank to assist in preparing the Outer Islands Electrification Program during calendar 2011. The Bank is preparing an investment lending operation for Board presentation, potentially during fiscal year 2012.

The proposed project scope, design, and implementation were anchored around PLN's large numbers of grid system operations, which are the responsibility of PLN's Eastern Indonesia Division. A critical underlying strategic driver for the project design is the concept of a systematically developed and staged programmatic sectorwide framework, and an implementation and financing plan for introducing renewable energy technology to reduce the operating costs of existing diesel-based generation units in PLN's mini-grid network, and extending the grid network systems in the eastern islands to improve electricity access.

ASTAE funding was requested to evaluate the project scope through an up-front rapid data assessment so that key sector data and relevant information could be assembled and reviewed to provide a comprehensive and substantiated factual basis—in scope and coverage—essential to support the design of the project concept by the Bank. A detailed scope of work was prepared for each consultant, and consultant performance and outputs were monitored closely to ensure compliance with the activity's objective leading up to the delivery of the ASTAE-funded data assessment.

The ASTAE-funded activity raised PLN's awareness of the stringent data and project-preparation requirements of a proposed Bank-funded activity to support the retrofitting of existing diesel-based generation with renewable diesel hybrid systems. It also galvanized the client to start compiling and monitoring the data in anticipation of project preparation. The activity also provided PLN with a framework for preparing those aspects of the project that it is funding itself. Finally, PLN, in partnership with the Bank, was able to bring other development partners into the dialogue to jointly finance the project. As a follow-up investment, PLN is funding the first 100 locations out of the total 1,000 locations that are included in the Outer Islands Electrification Program.

The stock-taking and data assessment performed with ASTAE support can be replicated for renewable-energy projects in other regions, leading to better project preparation and

subsequent investment lending. In this instance, these preliminary activities led to a well-planned and -orchestrated implementation program for Indonesia's Eastern islands that includes a least-cost grid extension program.





## SOLOMON ISLANDS: TINA RIVER HYDROPOWER DEVELOPMENT PROJECT, ADDITIONAL FINANCING

The government of the Solomon Islands places high priority on the Tina River Hydropower Development Project (TRHDP), a power generation scheme that would enable the country to (i) introduce a new renewable energy technology to its power system for the first time; (ii) save on imported diesel oil costs through the use of domestic water resources; (iii) reduce air pollution in the Honiara area; (iv) mobilize private sector capital for infrastructure development, thereby easing the demand on government budgetary resources and freeing resources for social sectors; and (v) build domestic capacity in hydropower and public-private sector operations and help catalyze future infrastructure private investments in the country.

The objective of ASTAE-supported activities was to help the Solomon Islands government to prepare the proposed TRHDP. Before FY2012, ASTAE provided financing to hire consultants with high-premium technical skills who are familiar with the low-capacity country environments, but are normally difficult to provide to clients within the scope of limited Bank budgets.

In FY2012, ASTAE provided additional support to two key activities: (i) carrying out additional work required to complete the feasibility study and (ii) analyzing tariffs and providing strategic advice to the government on the price of power purchases from the project and on the level of retail tariffs necessary to make the project affordable. See box 2-3.

During the stakeholder review of the Phase 1 Feasibility Study it became clear that there were no adequate baseline data in the country to give a complete understanding of the current physical and biological conditions within the affected areas. It was concluded that some preliminary field studies were required to prepare the Screening and Scoping Report part of the feasibility study. ASTAE funding was provided to carry out ecological and social surveys. In addition, ASTAE funded an environmental specialist consultant to support the Project Office in supervising the surveys and handling other environmental and social safeguards work.

The tariff at which the Solomon Islands Electricity Authority (SIEA) will purchase electricity from the developer will have a significant impact on the retail tariff at which consumers will purchase electricity from the SIEA. Similarly, the level and structure of retail tariffs will affect the ability of the SIEA to meet its payment obligations to the developer for electricity purchases. Thus, as part of the project preparation an electricity pricing adviser consulted with the government and the

transaction adviser on levels and alternative structures of the power purchase price and the retail tariffs. ASTAE financed a pricing adviser for phase 1 of the study. In phase 2, the pricing adviser will review and advise on retail tariffs, and it is expected that ASTAE will also support this work.

### BOX 2-3:

#### ASTAE'S CONTRIBUTION TO A PROPOSED SOLOMON ISLANDS TINA RIVER HYDROPOWER DEVELOPMENT PROJECT

**"ASTAE financing is critical for undertaking a highly challenging project in small island economies such as the Solomon Islands, which are characterized by very limited capacity; scarce hydrological, geological, and other necessary data; and complicated land ownership and sensitive socioeconomic cultures. For the proposed Tina River Hydropower Development Project, the challenges are compounded by the fact that this will be the first hydropower project of this scale to be developed and connected to the grid, and the first public-private participation in infrastructure. Thus, external skills are required in many areas and the shortage of ecological, social, and hydrological data calls for highly experienced consultants and, therefore, for a flexible funding source. ASTAE has contributed greatly to meeting these needs."**



Joel Maweni, Operations Advisor, Task Team Leader of Solomon Islands Tina Hydropower Development Project. He is located in Washington, DC.



## VIETNAM: DEMAND-SIDE MANAGEMENT AND ENERGY EFFICIENCY PROGRAM

Vietnam has enjoyed a period of extraordinary economic growth. The Bank's strategy has focused on meeting demand for electricity with reliable and cost-efficient power, while strengthening social inclusion by expanding access to the rural poor, and improving natural resource and environment management through increased system efficiency and promotion of the use of renewable energy. In fiscal 2011, the objectives of ASTAE activities were to (i) provide advisory assistance and capacity building to the Ministry of Industry and Trade (MOIT) to successfully implement two pilot programs on energy efficiency (EE); (ii) conduct workshops on practical experience exchange and business collaboration with experienced energy service companies (ESCOs) for Vietnamese ESCOs; and (iii) conduct a business opportunity study for expansion of commercial EE business to identify the building blocks for preparation of a Bank-financed follow-up demand side management (DSM)/EE project.

ASTAE allocated US\$510,000 of the GEF grant to MOIT to implement pilot programs on Promotion of Solar Water Heaters and on Development of Standards and Labeling for three electrical appliances. An experienced EE expert was hired by ASTAE to work closely with MOIT and local counterparts to provide advice and recommendations for both the preparation and implementation phases of the component project and build the capacity of MOIT staff.

ASTAE organized an experience exchange workshop in Hanoi with guest speakers from experienced ESCOs in China and Thailand. Local authorities and other stakeholders from other cities (Ho Chi Minh, Hai Phong, and elsewhere) also attended. A study tour to the Republic of Korea was conducted for a Vietnamese delegation from MOIT. The objective of these activities was to boost the business by addressing local partners' lack of practical experience through discussion of business opportunities, business models, and creation of collaboration opportunities with Vietnamese counterparts.

Finally, ASTAE provided support to the development of a Bank program to encourage a commercial DSM/EE market in Vietnam. ASTAE conducted a study on business opportunities of DSM/EE and developed mid- and long-term strategies for the Bank's engagement in DSM/EE development. Seven various studies were completed.

## VIETNAM: RURAL DISTRIBUTION PROJECT

The Rural Distribution Project was undertaken by the Bank to improve the reliability and quality of medium voltage service to targeted retail electricity distribution systems. This goal was to be achieved through investment in rehabilitating and increasing the capacity of existing distribution lines and substations. Technical assistance complemented the physical investment by supporting the development of the power companies into modern power distribution utilities.

The ASTAE-supported technical assistance under the Rural Distribution Project focused on building capacity in the power companies to act as independent participants in the power market as it develops according to the government's road map for reform. It was also to support the preparation of plans for completing the government's universal electrification program.

ASTAE financed consultant services to assist the power companies with implementing the technical assistance component of the project, provided part of the staff cost for managing the technical assistance component, and provided funds for a study tour to China for 40 key persons to exchange experiences on rural electrification.

## ASTAE PUBLICATIONS IN FISCAL 2011

ASTAE activities produce a number of outputs in various formats, depending on the target audience and the best way to deliver information to each audience. Most reports are byproducts of activities funded by ASTAE, although some are the end products. When suitable, the products are published, printed, and widely distributed to a broader audience, including through ASTAE's Web site. The purpose of each publication is to share—within and among countries in the region and beyond—the knowledge and experiences, especially innovative ones, generated by ASTAE activities.

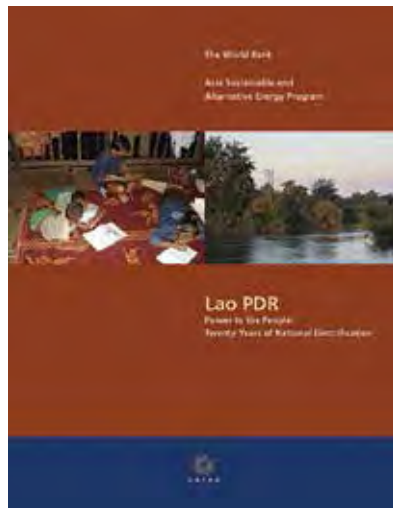
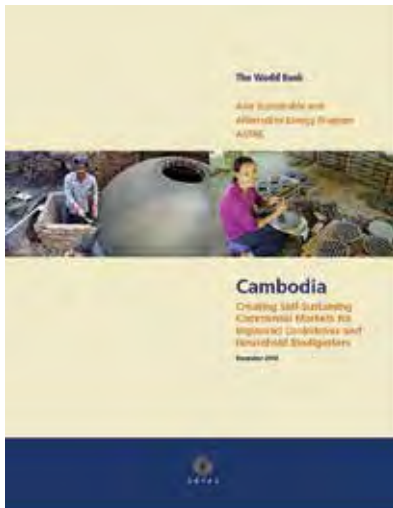
In fiscal 2011, ASTAE continued its technical report series of peer-reviewed, professionally published, high-quality consultant reports. These publications are being widely disseminated in print and in electronic form. Many other reports are not published, either because their value to the general public is limited or because they were confidential outputs delivered to partner countries.

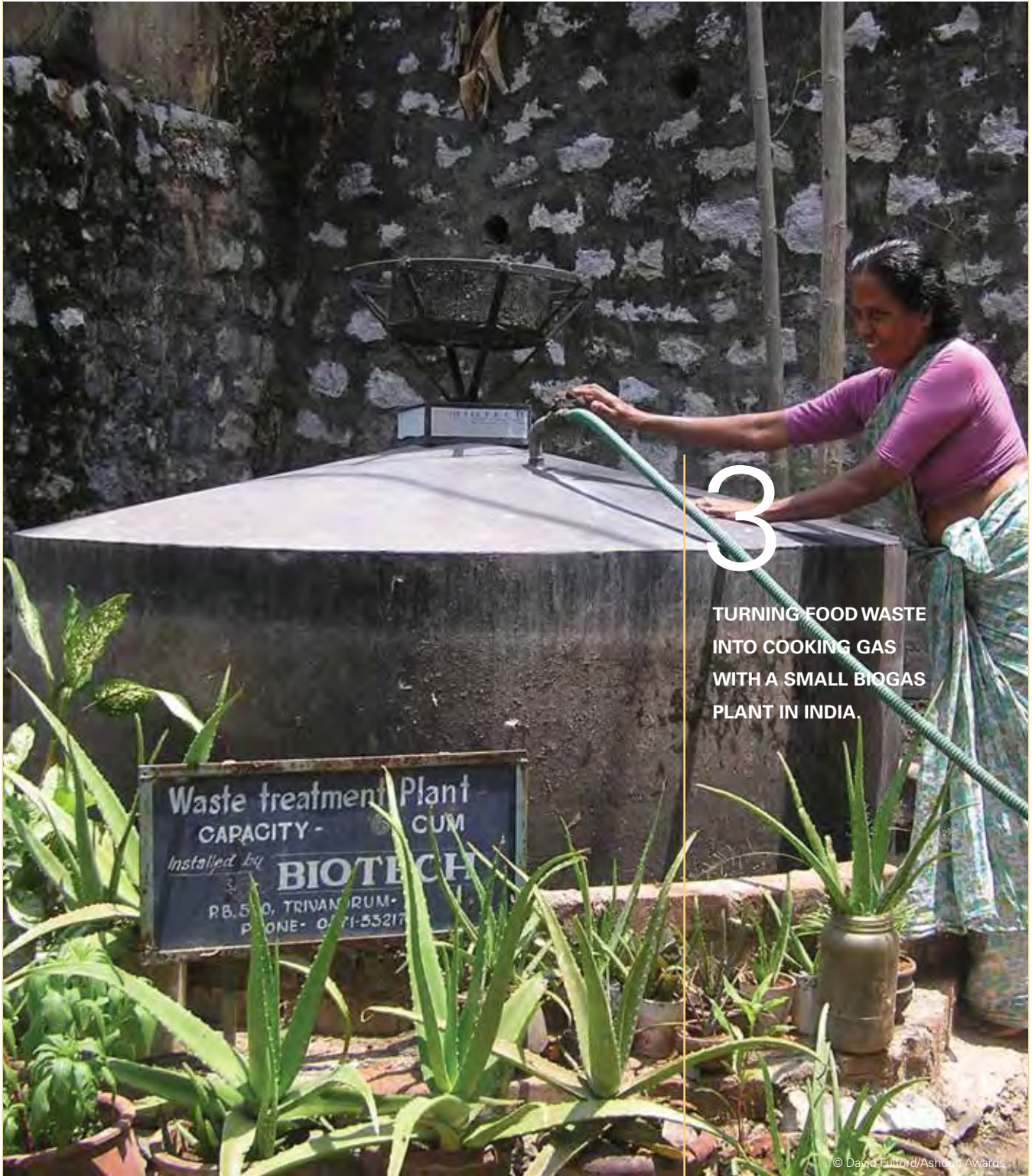
Following is a list of reports and publications produced in fiscal 2011:

- *Cambodia, Supporting Self-Sustaining Commercial Markets for Improved Cookstoves and Household Biodigesters*, December 2010
- *Timor-Leste, Key Issues in Rural Energy Policy*, December 2010
- *Vietnam, State and People, Central and Local, Working Together: The Rural Electrification Experience*, March 2011
- *Regional Transport, Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation: A Toolkit for Developing Countries*, June 2011
- *East Asia Region, One Goal, Two Paths: Achieving Universal Access to Modern Energy in East Asia and Pacific*, June 2010









# 3

TURNING FOOD WASTE INTO COOKING GAS WITH A SMALL BIOGAS PLANT IN INDIA.

### 3. ASTAE Performance Assessment— Fiscal 2007–11 Extended Business Plan

CHAPTER 2 DEALT SPECIFICALLY WITH ASTAE’S ACTIVITIES IN FISCAL 2011. THIS CHAPTER RE-VIEWS THE OVERALL PERFORMANCE OF ASTAE-FUNDED PROJECTS DURING THE FIVE YEARS OF THE JUST-CONCLUDED BUSINESS PLAN PERIOD, INITIATED FOR FISCAL 2007–09 AND EX-TENDED INTO FISCAL 2011 TO COMPLETE THE WORK AND FINALIZE THE DISBURSEMENTS.

#### ASTAE DISBURSEMENTS: LEVERAGE AND OVERVIEW OF ACTIVITIES IN THE 2007–11 EXTENDED BUSINESS PLAN PERIOD

During the past five fiscal years, ASTAE disbursements totaled US\$9,879,650 from two trust funds endowed by the governments of the Netherlands and Sweden with, respectively, US\$7.4 million and SKr15 million. The pledge from the government of the Netherlands was made in March 2006 for the fiscal 2007–09 original business plan period, and the pledge from the government of Sweden was made in May 2007, allowing the business plan’s reach to be extended into fiscal 2011.

#### Overview of Disbursements

The ASTAE budget for the 2007–11 business plan period was US\$9,898,614, composed of the business plan endowments by the governments of the Netherlands and Sweden, as well as approximately US\$0.6 million carried over from the Netherlands’ endowment to the previous business plan.

By the end of fiscal 2011, total donor resources disbursed by ASTAE had reached 99.8 percent of the US\$9.9 million budget.

As shown in figure 3-1, annual disbursements grew steadily from US\$1.2 million in fiscal 2007 to US\$2.6 million in fiscal 2011, far exceeding the average annual disbursements for the decade.

Figure 3-1: Evolution of Annual Disbursements and Comparison with Business Plan Budget

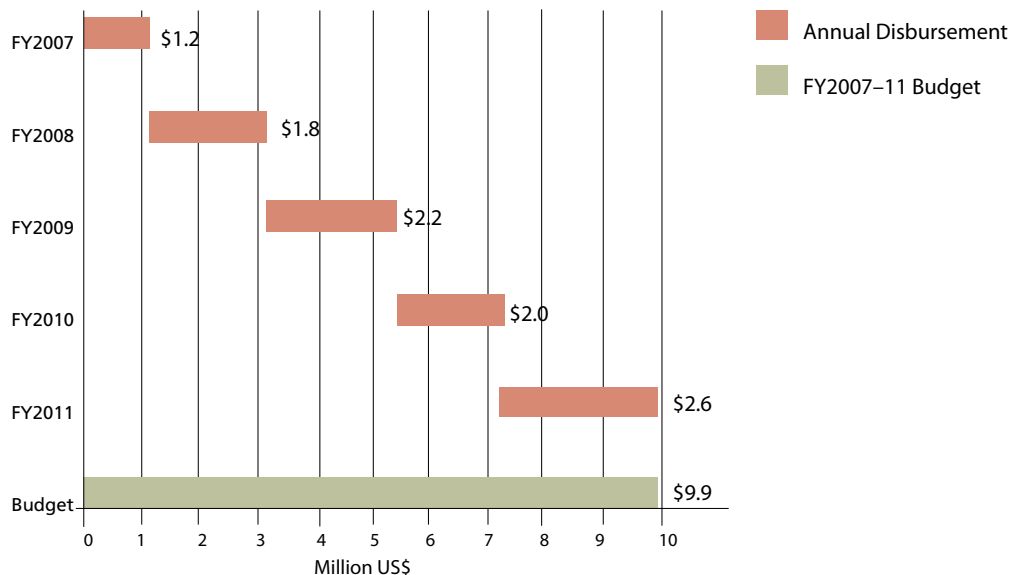


Table 3-1: Disbursements by Country during the 2007–11 Business Plan Period

Countries	Disbursements (in US\$)					Total
	FY 2007	FY 2008	FY 2009	FY 2010	FY2011	Period FY2007–11
Bangladesh	0	0	0	0	78,307	78,307
Cambodia	0	43,012	108,459	32,263	11,268	195,003
China	129,628	238,736	288,917	183,355	219,207	1,059,842
Fiji	0	41,987	69,485	0	0	111,472
India	0	0	55,879	0	229,538	285,417
Indonesia	77,850	0	175,253	326,323	462,929	1,042,355
Lao PDR	0	0	0	56,452	21,066	77,518
Mongolia	125,891	290,159	99,618	178,248	50,000	743,916
Pacific Islands	0	29,344	93,543	3,038	0	125,925
Philippines	37,567	1,344	36,132	23,336	0	98,380
Solomon Islands	0	238,936	76,449	63,705	198,097	577,187
Thailand	234,736	79,508	7,197	0	0	321,441
Timor-Leste	280,702	0	0	172,406	68,547	521,655
Tonga	0	0	48,867	100,851	0	149,717
Vietnam	51,083	356,067	188,704	161,677	857,877	1,615,408
Regional projects, Knowledge Sharing	6,212	34,765	373,644	335,423	225,764	975,809
Reporting	54,367	129,969	164,011	158,726	79,305	586,378
Administration	218,553	363,930	391,042	238,262	102,043	1,313,830
<b>Total</b>	<b>1,216,589</b>	<b>1,847,757</b>	<b>2,177,200</b>	<b>2,034,066</b>	<b>2,603,947</b>	<b>9,879,560</b>
% increase	n.a.	52	18	-7	28	

n.a. Not applicable.

The details of disbursements by country and fiscal year in table 3-1 show that total disbursements grew steadily across the period.

Figure 3-2 shows that Vietnam, at 20 percent of total expenditure, received a notable amount of financial support from ASTAE. China, Indonesia, and Mongolia also received regular and significant financial support from ASTAE (13 percent, 13 percent, and 9 percent of total expenditure, respectively).

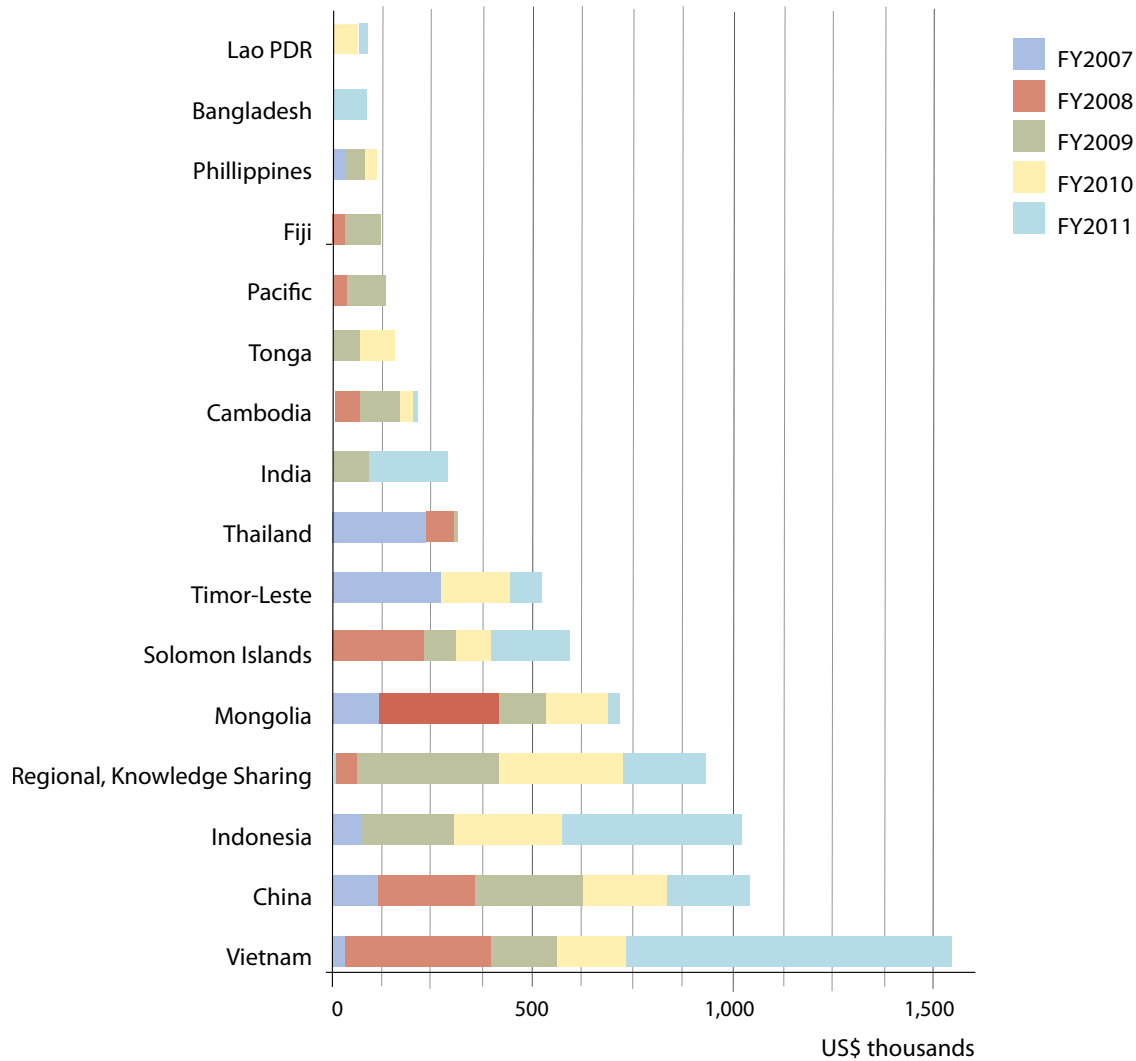
The decision to reach out to smaller Pacific Island countries was put into action by increasing support throughout the business plan period; these countries are now a major part of the ASTAE portfolio, with a collective 17 percent of

disbursements. Timor-Leste and the Solomon Islands account for the major portion of disbursements to Pacific Island countries (7 percent and 6 percent, respectively, of total disbursements).

Engagement with the South Asia Region continued through activities in India and Bangladesh. Although still small (4 percent and 1 percent of disbursements, respectively, having started in the latter half of the business plan period), these activities laid the path toward more balanced involvement in the two regions.

The growth in the share of regional knowledge-sharing activities, and in reporting activities (12 percent and 6 percent, respectively), reflects ASTAE's continued commitment to share

Figure 3-2: Disbursements by Country and Financial Year



good practices both within and across the South and East Asia regions, and to develop information that has value beyond a single country by supporting regional activities and improving the means of outreach and external communication.

Abiding by the agreement with ASTAE donors, ASTAE's administrative costs remained well below 20 percent, in fact averaging 13.4 percent of total disbursements.

### Investment-Related Leverage

The disbursements described above served to leverage additional investment once ASTAE-supported projects had been appraised, approved, and implemented. During the 2007–11 business plan period, the US\$9.9 million donor resources disbursed by ASTAE supported 17 projects that had been presented to the World Bank Board of Executive Directors. The total lending related to these projects amounted to US\$2.2 billion, of which 51 percent was sourced from IBRD and IDA,

and the rest from borrowing countries' governments, other donors, and the private sector.

Therefore, on average, every dollar allocated by ASTAE leveraged US\$223 in World Bank-related loans or grants to sustainable energy. These leveraged amounts vary from year to year, as do ASTAE's annual disbursements and the number and size of World Bank projects presented to the Board. Caution must be exercised when referring to such leverage—claiming full ASTAE attribution would be unrealistic and unfair to all those involved in developing the projects, including the governments and the Bank Task Team Leaders.

However, such leverage can be seen as a good indicator of ASTAE funding's reach into Bank operations, thus providing a certain measure of ASTAE influence in channeling funds toward sustainable energy. This leverage is especially important in periods of flat budgets, when the institutional appetite is decreased for the type of less mainstream, innovative projects—often perceived as riskier and costlier—required to promote the adoption of sustainable energy solutions. By contrast, availability of ASTAE funds ensures the study will be conducted, the consultant hired, or the concept tested that will nudge the decision-making process to the finish line.

### Activity Repartition by Countries and Pillars

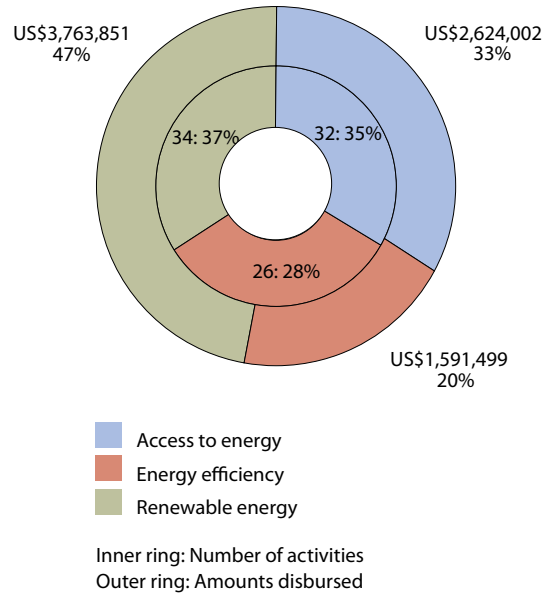
ASTAE funded 68 activities during the FY07–11 business plan period. Many of these related to several pillars, which explains why the total activities in figure 3-3 is more than 68 (see further details on this in "Introductory Note to Figures" in chapter 2).

ASTAE disbursements by pillar, illustrated in figure 3-3, show that although the primary focus of disbursements is on renewable energy, ASTAE task teams managed to balance the number of activities among the three pillars in the global portfolio, when taking into consideration both primary and secondary themes of activities.

The renewable-energy pillar received close to half of all disbursements. Access-related activities received a third of the disbursements, demonstrating the continued importance of this pillar in the ASTAE strategy. Energy-efficiency-related activities, which often include cross-sector activities, such as with the transport sector, received about 20 percent of funding.

Figures 3-4 through 3-6 provide an overview of disbursements during the business plan period for each pillar, sorted by country, with the full disbursed amount allocated to the primary pillar. These figures reveal the attention given by ASTAE to channeling funding toward the pillar requiring the most support for each country.

**Figure 3-3: Disbursements, by ASTAE Pillar, 2007–11 Business Plan Period**



**Figure 3-4: Renewable-Energy Disbursements, by Country, 2007–11 Business Plan Period**

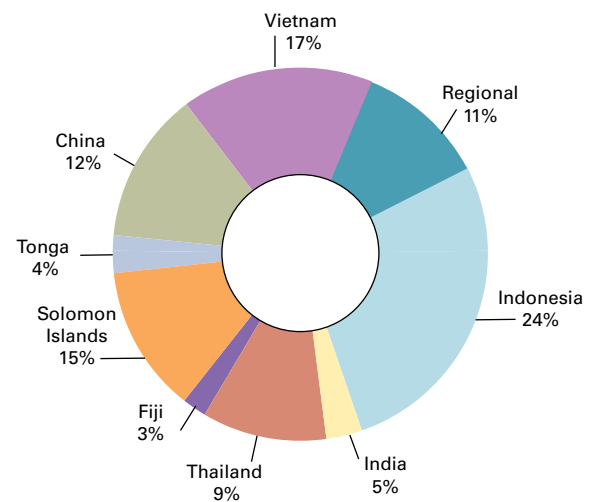
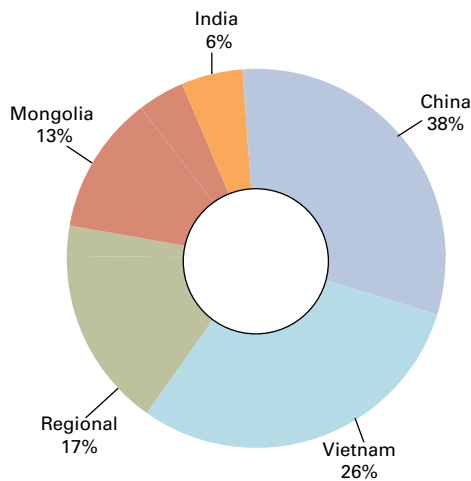


Figure 3-4 shows a diverse distribution of renewable-energy funding among countries in the East Asia and Pacific region. Although interest in renewable energy is led by large countries with robust domestic carbon-footprint-reduction programs, as in China, Indonesia, Thailand, and Vietnam, it is no longer limited to these countries. In fact, ASTAE’s work in the Pacific Islands has dramatically increased, representing a fifth of disbursements in renewable energy for the business plan period. Energy insecurity caused by fluctuations in international fuel prices is driving this concern, along with renewed interest in exploiting indigenous sources of renewable energy. Regional activities were also undertaken—collectively representing 11 percent of disbursements—for the production of flagship reports as well as the elaboration of practitioners’ tools.

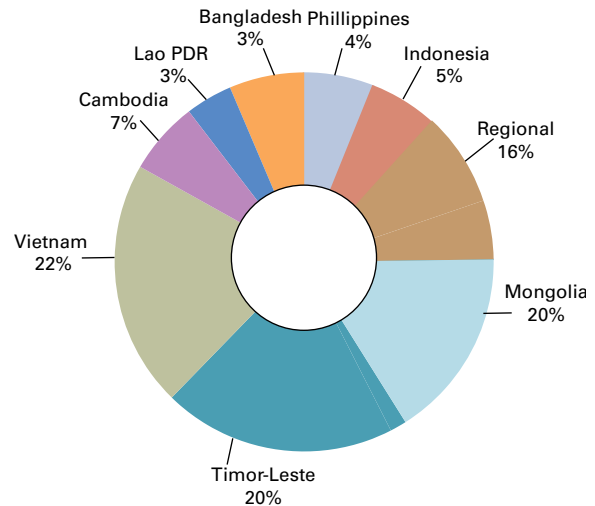
Figures 3-5 and 3-6 show that, in comparison with those on renewable energy, the disbursements for the energy-efficiency and access pillars are focused on a different set of countries.

**Figure 3-5: Energy-Efficiency Disbursements, by Country , 2007–11 Business Plan Period**



China and Vietnam together account for the predominant share of energy-efficiency disbursements, at two-thirds of the total. ASTAE’s continued involvement in helping those countries’ industries realize their energy savings potential, and decrease the energy-related impact of their productive sectors, is the impetus behind this large share. In addition, groundbreaking regional work related to energy use in the transport sector and the related impact of CO<sub>2</sub> emissions was undertaken.

**Figure 3-6: Access to Modern Energy Services Disbursements, by Country, 2007–11 Business Plan Period**



Mongolia, Timor-Leste, and Vietnam each represent about one-fifth of disbursements for access to electricity, and illustrate the variety of realities and challenges that countries encounter in their efforts to increase access. In Vietnam, ASTAE provided support to Bank programs assisting the government’s efforts to deliver access to electricity to the final 10 percent of the population, primarily in remote rural areas. With 95 percent of the population now electrified, a large part of the current work is on improving the quality and the reliability of electricity service. In contrast, access is much lower in Timor-Leste, where only 21 percent of the population has electricity. A different kind of support is provided in Timor-Leste, focusing on basic new connections, increasing customer payments, and increasing the number of hours per day that electricity is available. Finally, Mongolia is in yet a different position, relying on an aging network that covers urban and peri-urban populations quite well, but is in disrepair, and needing to provide access to a very dispersed rural population that can be reached only through individual systems.

Efforts to deliver improved access to energy are not limited to electricity. ASTAE plays a leadership role within the World Bank East Asia energy unit in promoting attention to energy used for heating, for both space heating and cooking. The work in Timor-Leste supported establishment of a rural energy policy with practical recommendations for household energy and the development of biofuels from *Jatropha* crops. In

Mongolia, ASTAE activities provided market-based approaches, as well as policy recommendations, for switching to energy-efficient heating stoves and cleaner fuels in ger households. In Cambodia, ASTAE supported activities that focused on creating sustainable business models, especially directed toward empowering women. These enterprises had strong scale-up potential for producing affordable, energy-efficient products for local use. The ASTAE activities included elements to train participants in the skills required to participate in planning, working in, and managing those enterprises.

## STATUS OF 2007–11 PERFORMANCE INDICATORS

In addition to reporting on its activity disbursements and reporting on World Bank–related investment projects (see appendix 4), ASTAE tracks a set of indicators showing the trajectory of its impact in supporting sustainable energy development.

The indicators were chosen to illustrate each pillar. Although they may not cover the pillar’s entire spectrum—for example, there is more to renewable energy than generating electricity using renewable sources—the indicators convey the predominant trend. The indicators are usually available from World Bank project documentation and are therefore easily referenced from published sources. A project’s achievements are measured as direct when they result from World Bank loans and grants and as indirect when the impacts are derived from country stakeholder actions supported by World Bank and ASTAE technical assistance. Contributions from all projects during the business plan period were compiled to derive the indicators described below.

Appendix 2 provides a table linking all ASTAE activities disbursed in fiscal 2011 to the related World Bank projects, and shows their contributions to ASTAE indicators.

When relevant, the aggregate value achieved for each indicator is put in context by comparing it with an equivalent output at the level of a country of the region, using U.S. Energy Information Agency (EIA) 2008 data. Although a little dated, 2008 is the most recent year for which data comparable among all ASTAE countries are available.

### Renewable-Energy Pillar

The renewable-energy pillar is illustrated by an indicator measuring electricity generated using renewable fuel. Through support to projects that directly facilitated investment in renewable energy, ASTAE activities led to increased capacity

and generation from renewable sources. This indicator focuses on electricity, thus omitting investments in renewable sources of heat (such as for cooking or space heating), but is nonetheless considered a good marker for investments in renewable energy in general.

### Indicator 1: New capacity and increased generation of renewable electricity

Table 3-2 provides the renewable electricity capacity added during the five years of the business plan period, both directly through World Bank loans and indirectly from investments facilitated by World Bank projects and ASTAE activities.

**Table 3-2: Cumulative Renewable Electricity Capacity Added, by Country, FY2007–11 Business Plan Period**

Countries with ASTAE activity	Renewable electricity generation (capacity installed in MW)	
	Direct	Indirect
China	537	4,900
Fiji	5.6	n.a.
Indonesia	260	6,000
Mongolia	2	n.a.
Philippines	40	n.a.
Solomon Islands	5.6	n.a.
Thailand	n.a.	1,500
Tonga	n.a.	10
Vietnam	180	n.a.
Regional projects	n.a.	30.6
<b>TOTAL</b>	<b>1,030.2 MW</b>	<b>12,440.6 MW</b>

n.a. Not applicable.

Most of the direct World Bank–funded renewable-energy capacity growth during the business plan period was from wind in China and geothermal in Indonesia. Smaller contributions were made by solar and biofuels in other countries such as Mongolia and Tonga. Technical assistance to China and Indonesia in policy and sector reforms is expected to give rise to a number of private sector projects to scale up renewable energy, leading to the indirect portion of this indicator.

ASTAE’s targets for renewable-based electricity were not expressed in installed capacity, but rather in annual electricity generation (1,000 GWh directly and 10,000 GWh indirectly) once projects were fully commissioned. However, most Bank



project documentation does not provide renewable electricity generated, focusing instead on MW installed and then estimating the corresponding GWh. ASTAE follows the same process.

As shown in the summary at the end of this chapter (table 3-6), these targets were met and exceeded. World Bank projects supported by ASTAE during the 2007–11 business plan period are expected to result in installed capacity of 1,030 MW of renewable energy that will generate 1,579 GWh annually once commissioned. This is equivalent to the combined installed capacity of Lao PDR and Cambodia in 2008, as well as to the sum total of electricity generated in Cambodia in 2009.

In addition, ASTAE- and World Bank-funded support to frameworks, regulations, and investment mechanisms favorable to renewable-energy development are expected to contribute indirectly to the installation by utilities and private investors of 12,440 MW, which is expected to generate 18,000 GWh annually once commissioned.

### Energy-Efficiency Pillar

The energy-efficiency pillar is evaluated by an indicator of the quantity of electricity saved, or generation capacity avoided, by decreasing consumption, reducing waste, or both. It is a measure of the support to projects that limit the need for electricity generation throughout the year and limit the need for additional installed capacity to meet annual peak demand. Because this indicator focuses on electricity, it does not reflect ASTAE's work in heating, primarily space heating in northeast Asia, or in cookstove improvements. It is still considered a good marker for investments in energy efficiency.

#### **Indicator 2: Electricity savings resulting from efficiency improvements**

Table 3-3 provides a summary of cumulative annual electricity savings that derive from ASTAE-supported World Bank projects once fully implemented. These estimates are calculated based on direct savings through World Bank loans or on indirect support by way of investments facilitated by World Bank and ASTAE technical support.

As noted earlier, ASTAE activities related to improving efficiency in the power sector were concentrated in a few high-impact countries. ASTAE provided significant financial support to electricity savings in the Vietnam rural electrification project, which has delivered direct impacts by improving medium- and low-voltage networks and reducing losses dramatically—representing 95 percent of total program-wide direct savings.

**Table 3-3: Cumulative Electricity Savings, by Country, FY2007–11 Business Plan Period**

Countries with ASTAE activity	Electricity savings (GWh electricity, annually)	
	Direct	Indirect
China	n.a.	20,000
Fiji	3.3	400
Philippines	80	n.a.
Solomon Islands	3.3	n.a.
Thailand	n.a.	400
Vietnam	1,500	n.a.
<b>Total</b>	<b>1,586.6</b>	<b>26,150</b>
n.a.: Not applicable.		

One major source of indirect savings (76 percent of total) is an ASTAE-supported activity in China that led to banks' creating new financial products to fund energy-efficiency projects; another important result came through ASTAE's contribution to the energy-efficiency road map in Thailand that helped focus the government on priority sectors with the highest savings potential.

The summary (table 3-6) shows that the business plan targets for both direct and indirect annual electricity savings have been exceeded. When all projects are operational, direct savings will be 1,586 GWh annually and indirect savings will be more than twice the target, at 26,150 GWh annually. The direct savings figure is equivalent to halting electricity generation in Cambodia for 2009, while the indirect savings amount to Bangladesh generation for the better part of the same year.

### Access to Modern Energy Services Pillar

The access to energy pillar is measured by the number of households that received new or improved connections to modern energy services, regardless of the type of fuel. Under this method, an improved wood-burning stove that reduces smoke emissions and decreases consumption of raw wood for the same heat output is equivalent to an improved electricity connection. Although the type of service differs markedly—cooking and heating on one hand and lighting, information, and potentially productive uses on the other—they are treated as being of the same value to the beneficiary.

Distinctions between connection types are based on whether they are new connections or improved ones, and whether ASTAE's contribution was direct or indirect.

**Indicator 3: Households with access to modern energy services**

New connections to electricity have life-changing impacts, whether because of new opportunities opened by access to electricity or improved efficiency in daily tasks made possible by the use of powered tools and appliances. Improved connections help remove constraints on households, often by lowering the amount of fuel needed or by improving the reliability of existing services, thereby eliminating the need for backup service. For example, improved electricity connections in Vietnam helped reduce the need for alternative sources of lighting, such as kerosene lamps or candles, that were needed when unplanned blackouts were a frequent occurrence.

It should be noted, however, that the distinction between new and improved services is not always as obvious as it might appear. A new connection is often, in fact, an improved connection to the same service but using a more efficient fuel source. For example, a new connection to electricity displaces the use of kerosene for lighting or batteries for radios, and provides a much more efficient and less costly source, but does not bring new lighting services or radio use because these were already in place.

Table 3-4 shows that the rural electricity project in Vietnam is by far the most important activity for increasing household access under the ASTAE program. This achievement was possible because large numbers of people were not connected to the national grid and because the government took voluntary actions to provide universal access to electricity.

Access to electricity remains the major component of the indicator, but space heating in Mongolia and cookstoves and biogas in Cambodia and Timor-Leste contributed, too.

Direct targets have been met, with ASTAE-supported World Bank projects financing improved services to 2 million households (four times the target of 500,000) and new access to modern energy services to an additional 648,450 households (129 percent of the target of 500,000 households) (see table 3.6).

Indirect targets were only partly met if new and improved access to energy are assessed separately, but as an aggregate measurement, ASTAE's achievement in this regard has exceeded the targets. ASTAE-supported projects fell 20 percent short of meeting the indirect goal of 250,000 households with improved services. However, new access that indirectly resulted was more than nine times the modest target of 50,000 households, and with 470,000 households, would

**Table 3-4: Households with Access to Modern Energy Services, by Country, 2007–11 Business Plan Period**

Region and country of activity	Households with access to modern energy services (number of households)	
	Direct	Indirect
Cambodia	17,500 (NA)	n.a.
China	n.a.	300,000 (NA)
Fiji	22,050 (NA)	n.a.
Indonesia	n.a.	200,000 (IS)
Lao PDR	37,700 (NA)	n.a.
Mongolia	226,000 (NA)	150,000 (NA)
Solomon Islands	92,200 (NA)	n.a.
Timor-Leste	80,000 (NA)	n.a.
Tonga	n.a.	20,000 (NA)
Vietnam	150,000 (NA) 2,000,000 (IS)	n.a.
Regional projects	23,000 (NA)	n.a.
<b>Total</b>	<b>648,450 (NA) 2,000,000 (IS)</b>	<b>470,000 (NA) 200,000 (IS)</b>
n.a.: Not applicable.    NA: New access    IS: Improved services		

also have been well over target had it been set at the same level as the improved services target.

### Cross-Cutting Indicators

A fourth and a fifth indicator that cut across the three pillars also have been defined. One is dependent on the results from the three pillars' individual indicators, whereas the other is a more general assessment of ASTAE's involvement across the region.

The fourth indicator measures reductions in CO<sub>2</sub> emissions, representing the overall impact on greenhouse gas abatement. It is an important metric because CO<sub>2</sub> emissions are considered the main contributor to the greenhouse effect. ASTAE activities have a direct impact on CO<sub>2</sub> reduction through World Bank project contributions to renewable energy, energy efficiency, and improved access to modern energy services.

The fifth indicator ensures that financial assistance is provided to all countries in the region and avoids the unintended trap

of focusing on large countries just to meet the earlier four indicators.

**Indicator 4: Avoided greenhouse gas emissions**

This indicator estimates the quantity of CO<sub>2</sub> emissions that would be avoided over 20 years (the conventional lifespan of projects or equipment) through ASTAE-supported World Bank projects. It determines the CO<sub>2</sub> equivalent saved directly and indirectly through the replacement of conventional thermal power plants with renewable energy and realizing the potential energy savings.

Table 3-5 shows that China accounts for more than half of the direct CO<sub>2</sub> savings. However, projects in Indonesia and Vietnam contribute large shares of avoided CO<sub>2</sub> emissions. The table also confirms that to substantially scale up CO<sub>2</sub> emissions mitigation, support to country programs that encourage sustainable energy use in energy-intensive economic sectors has the greatest effect. This is illustrated by the fact that indirect CO<sub>2</sub> mitigation is 10 times greater than direct mitigation. The indirect impacts are led by mitigation expected from restarting a major investment in geothermal in Indonesia and by continued private sector investment in alternative energy in China.

The CO<sub>2</sub> targets have been met (table 3.6). The direct impact value, estimated at 114 million tons, or 162 percent of the target, would be roughly equivalent to all of Vietnam's energy-related CO<sub>2</sub> emissions in 2008. The indirect savings, estimated to be 1,097 million tons, or 140 percent of the target, would be equivalent to the total CO<sub>2</sub> emissions of the African continent in 2008.

**Indicator 5: Countries benefiting from ASTAE support**

ASTAE provided financial support to activities in 14 countries, as well as to several regional activities, markedly exceeding the target of a minimum of 10 countries. A number of the Pacific Island countries were represented, in addition to the large continental countries. The differences among countries in Asia where ASTAE is active are vast, ranging from China and India, the dominant economies of the region, to the much smaller Tonga and Fiji. All ASTAE activities are designed to adapt to the wide variety of issues throughout the region, as well as to the country context. Table 3-6 provides a summary of all indicators discussed in this chapter.

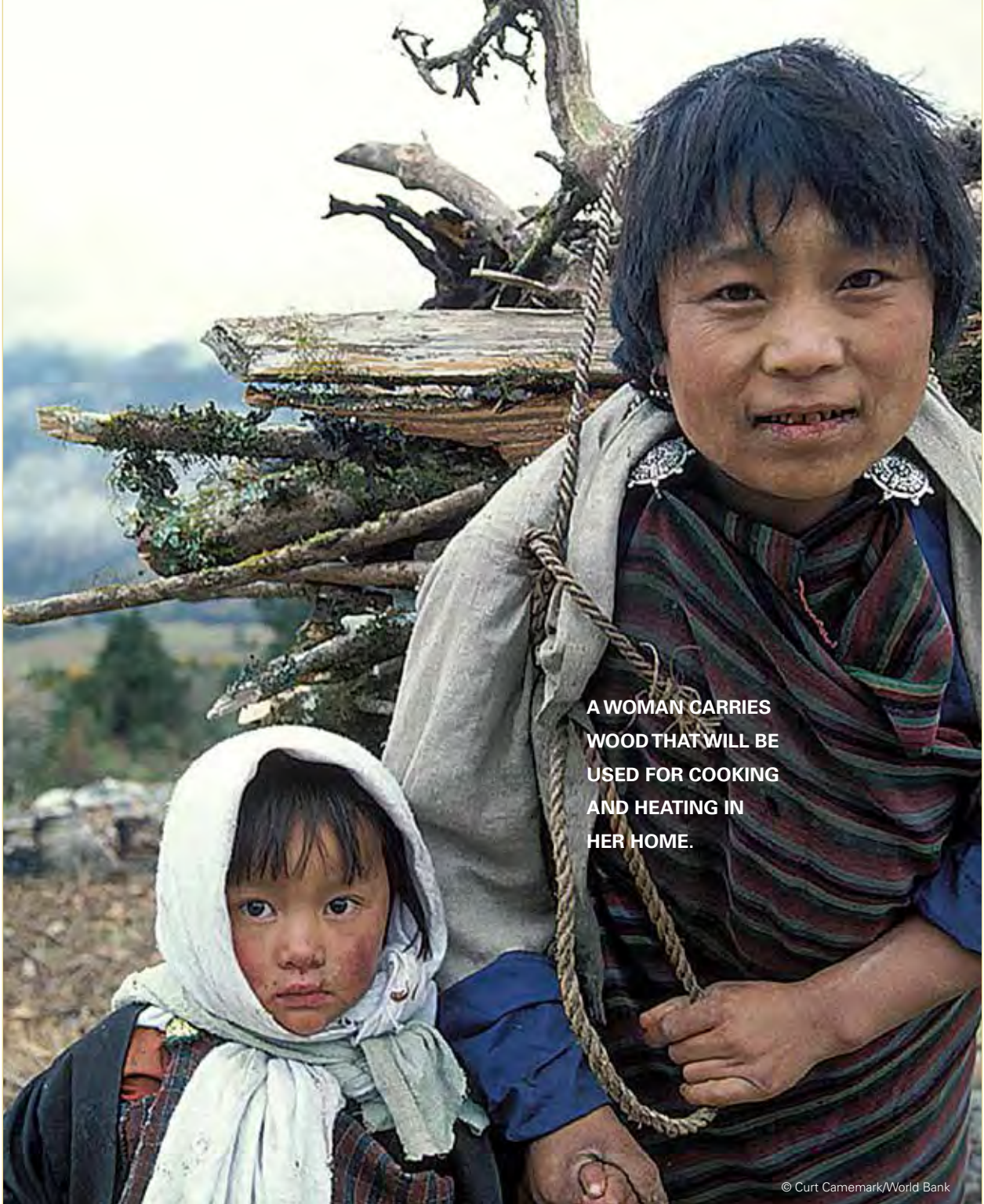
**Table 3-5: CO<sub>2</sub> Mitigated, by Country, 2007–11 Business Plan Period**

Countries with ASTAE activity	CO <sub>2</sub> mitigated over 20 years (million tons)	
	Direct	Indirect
Cambodia	1.52	n.a.
China	61.42	510.00
Fiji	0.17	2.46
India	4.80	n.a.
Indonesia	21.00	500.00
Mongolia	0.18	n.a.
Philippines	2.00	n.a.
Solomon Islands	0.17	n.a.
Thailand	n.a.	82.00
Timor-Leste	2.20	n.a.
Tonga	n.a.	0.32
Vietnam	20.28	n.a.
Regional projects	n.a.	0.50
<b>Total</b>	<b>113.74</b>	<b>1,085.28</b>

n.a.: Not applicable.

Table 3-6: Summary of 2007–11 Extended Business Plan Targets, Pledged and Achieved

Indicators		Unit	Value pledged for business plan period	Effectively achieved during business plan period	Achieved or pledged ratio (%)
<b>1. NEW CAPACITY AND INCREASED GENERATION OF RENEWABLE ELECTRICITY</b>					
Direct renewable energy	- Capacity - Generation	MW GWh/year	n.a. 1,000	1,030 1,579	n.a. 158
Indirect renewable energy	- Capacity - Generation	MW GWh/year	n.a. 10,000	12,440 18,018	n.a. 180
<b>2. ELECTRICITY SAVINGS RESULTING FROM EFFICIENCY IMPROVEMENTS</b>					
Direct energy savings	- Generation	GWh/year	1,000	1,586	159
Indirect energy savings	- Generation	GWh/year	10,000	26,150	262
<b>3. HOUSEHOLDS WITH ACCESS TO MODERN ENERGY SERVICES</b>					
Direct <sup>a</sup> new access		Household	500,000	648,450	129
Direct improved services		Household	500,000	2,000,000	400
Indirect <sup>b</sup> new access		Household	50,000	470,000	940
Indirect improved services		Household	250,000	200,000	80
<b>4. AVOIDED GREENHOUSE GAS EMISSIONS</b>					
Direct CO <sub>2</sub> avoided over 20 years		Million tons	70	114	162
Indirect CO <sub>2</sub> avoided over 20 years		Million tons	780	1,085	4
<b>5. COUNTRIES BENEFITING FROM ASTAE SUPPORT</b>					
Number of Countries		Country	10	14	130
<p>n.a.: Not applicable.</p> <p>a. Direct refers to values achieved, or expected to be achieved, in the course of World Bank–funded projects that benefited from ASTAE support.</p> <p>b. Indirect refers to values achieved, or expected to be achieved, following actions engaged in by countries' energy stakeholders that result from informed decisions to which ASTAE contributed through its funding.</p>					



A WOMAN CARRIES  
WOOD THAT WILL BE  
USED FOR COOKING  
AND HEATING IN  
HER HOME.

© Curt Camemark/World Bank



TRANSMISSION LINES  
ON THE NAKAI PLA-  
TEAU, LAO PDR.

# 4

## 4. Outlook for Fiscal 2012 and Beyond

FISCAL 2011 SAW BOTH THE COMPLETION OF THE 2007–11 BUSINESS PLAN AND PREPARATION FOR THE UPCOMING ONE, IN PARALLEL WITH THE ORGANIZATION OF RENEWED FUNDING FROM ASTAE DONORS.

### STAFFING AND FUNDING STATUS IN FISCAL 2011

#### Staffing in Fiscal 2011

The ASTAE team comprised the following members in 2011:

- Mr. Narasinhham Vijay Jagannathan, sector manager for the East Asia Infrastructure Unit (EASIN), has been the ASTAE program manager since July 2009.
- Mrs. Natsuko Toba, senior economist in EASIN, has been ASTAE coordinator since May 2010.
- Mr. Dejan Ostojic, energy practice leader in EASIN, provides strategic support to the program manager and the coordinator for activities in East Asia and the Pacific.
- Ms. Sudeshna Banerjee, senior economist, provides strategic support to the program manager and the coordinator for activities in South Asia.
- Mr. Laurent Durix, senior energy consultant, provides technical support to the program manager and the coordinator.

#### Funding Status in Fiscal 2011

In fiscal 2011, ASTAE activities remained endowed by the two trust funds:

- Government of the Netherlands Trust Fund for ASTAE from the Bank-Netherlands Partnership Program (BNPP) (TF057088); and
- Swedish International Development Agency (Sida) Trust Fund for ASTAE (TF091618).

The Netherlands Trust Fund was extended to December, 31, 2010, at which date it was closed and the amounts received were disbursed at 99.8 percent by April 30, 2011.

The Swedish Trust Fund was extended to February 28, 2011, at which date it was closed and the amounts received were disbursed at 99.9 percent by June 30, 2011.

### ASTAE BUSINESS PLAN FOR FISCAL 2012 AND THE FUTURE

#### Lessons Learned and Going Forward

Following are key lessons learned from ASTAE operations during the two previous multiyear business plan periods as reflected in the next business plan for FY2012–15.

- *Indicators* were confirmed to be a valuable tool for tracking ASTAE's success and influence. However, the introduction of indirect impacts in 2004 made tracking more difficult. Although both direct and indirect impacts should be tracked, target values should be pledged only for direct impacts because they are within the Bank's sphere of direct influence.
- *Regional scope.* Two key issues with regard to ASTAE's regional scope emerged during the later years of the previous business plan: reintegration of the South Asia Region (SAR) and strengthening of ASTAE's regional impacts. ASTAE will need an increased budget to fairly accommodate the increasing joint demand from EAP and SAR. Given the importance of regional cooperation and of sharing knowledge and experience among countries to promote sustainable development and green growth, ASTAE has ensured that single-country projects have regional impacts.<sup>2</sup> These impacts are crucial and ASTAE's ability to effect them should be further strengthened.
- *Sectoral scope.* As Asian countries have become increasingly interested in promoting low-carbon, green growth—harmonizing growth between the economy and the environment—the cross-sectoral dimensions of the energy

<sup>2</sup> For example, ASTAE disseminates lessons learned from projects by producing reports and videos. ASTAE's support to projects also includes training tours from one country to another (for example, sending Mongolian utility staff for training in the Philippines), and sharing experiences of electrification successes in Vietnam and Lao PDR. ASTAE contributes funding to EAP flagship reports through which EAP energy strategy and project pipelines are built. ASTAE funded a greenhouse gas emission reduction toolkit in the road construction subsector, which will be used for Bank projects. Such regional cooperation extends beyond Asia: ASTAE's support to light-emitting diode screening methodologies in Africa is one example.

sector have received more emphasis. ASTAE has provided such cross-sectoral support in both the transport and the social sectors. ASTAE is strategically positioned for future cross-sectoral issues: it is located in the EAP Sustainable Development Department, which includes the environmental, agricultural, infrastructure, and social sectors. And in the SAR, its energy unit works closely with other units.

- *Execution.* Recipient-executed trust fund (RETF) activities have been requested by donors and encouraged by the Bank's recent policy to further strengthen client ownership of programs and projects. ASTAE will introduce these activities in addition to current Bank-executed trust fund (BETF) activities.

- *Management.* Consistent with the Bank's decentralization policy, Task Team Leaders are increasingly located in the field, coinciding with increased demand from the SAR for ASTAE support. Because this increases the scale of management covering SAR and EAP, management procedures need to be streamlined and governance strengthened. The proper mix of clear rules and flexibility will be needed to preserve the balance that has been central to ASTAE's successes over two decades.

- *Funding instrument.* A multiplicity of ad hoc trust funds, often with specific restrictions, can lead to high transaction costs. Hence, a new multidonor trust fund (MDTF) has been created as the preferred funding instrument for ASTAE's new business plan. However, bilateral arrangements for single trust funds remain an option under the umbrella of ASTAE's financing facility. In addition to the challenges caused by the management of multiple funding sources, the execution of the previous business plans has made it obvious that business plan periods need to be longer. The current three-year business plans do not permit optimal use of funding: the first year is often spent setting up funds and the last is spent rushing to disburse funds, including those received in that year, resulting in insufficient time for execution. To prevent this situation, each business plan will now begin the year after ASTAE receives funding and will cover a four-year period, the last year of which will be devoted to establishing the next plan. Business plans will follow fiscal rather than calendar years, consistent with Bank practice.

### ASTAE Business Plan for FY2012–15

The challenges ahead for ASTAE, based on experience and the characteristics of the region, are numerous:

- Both the SAR and the EAP comprise countries with widely varying levels of economic development, geographic

size and remoteness, resource endowments, and cultures.

- Urbanization in the more advanced economies in the region has been occurring much more rapidly than expansion of basic infrastructure. A number of these urbanizing areas require solutions similar to those being undertaken in developed economies, such as low-carbon growth, economically and ecologically sustainable cities, smart grids, and the like.

- Conversely, the less advanced economies suffer from very low levels of access to basic infrastructure, limited capacity to develop and implement even simple projects, and nonexistent master plans and strategies. For some, the small size of their economies and their remoteness and isolation underpin these issues.

- Common to most countries in the region, however, is low access to clean, modern energy, compounded by weak governance, including legal, institutional, and regulatory frameworks.

- Finally, both the SAR and the EAP are vulnerable to climate change and other environmental impacts.

These challenges make it ever more important for ASTAE to continue to focus on its three existing pillars, to more vigorously promote green growth, and to devote greater attention to regional and cross-sectoral cooperation, both physically and through the sharing of knowledge and experience.

ASTAE is well positioned to tackle these challenges and opportunities based on its track record of success since its establishment in 1992 as evidenced by the achievement of targets set in previous business plans, favorable reviews by external experts from the Bank, and ASTAE's impact on the EAP's, the SAR's, and the Bank's portfolios. Through its focus on energy, ASTAE can play a crucial role in promoting low-carbon, green growth—an emerging worldwide trend, especially in Asia. ASTAE has a significant advantage in promoting regional cooperation to scale up a range of sustainable energy practices from one country to the regional level. Without ASTAE support, the scaling up of sustainable energy practices is likely to slow in the SAR and the EAP, and the EAP may not be able to take leadership and share lessons learned with the SAR and the rest of the World Bank Group.

ASTAE engages with client countries from the very early stages of decision making to ensure that investment projects presented to the World Bank Executive Board for approval will promote sustainable development and poverty reduction. For



example, ASTAE's technical assistance contributes to the high quality of client-prepared feasibility studies so that the Bank can better prepare and appraise projects for Board approval. ASTAE's technical assistance to client countries at the earlier stages not only helps to identify issues and sustainable energy solutions (potential investment projects), but also can identify and mobilize potential funding sources.

ASTAE is among the most efficient trust fund programs and brings unique competitive advantages. Because ASTAE resources are used to fill only critical financial gaps (for example, innovative technologies and activities, and resolution of difficulties), its leverage of Bank investment and grant activities is significant. Valuable taxpayer money is spent effectively as a result of ASTAE's high leverage of donor funding; for example, during the five years of the FY07–11 business plan period, every dollar allocated by ASTAE leveraged US\$223 in World Bank–related loans or grants to sustainable energy. In addition, ASTAE management is located in the regional operational unit, ensuring that decision making about providing ASTAE support is better informed. Management knows the projects and the proposed activities—which are demand driven and delivered on the ground—and the strategic priorities. Location in the region enables ASTAE's timely support and feedback and its strong country and regional influence. The information and publications ASTAE disseminates, even its high-level technical analyses, are practical and applicable to operational realities. ASTAE's information and publications meet the needs of Task Team Leaders, other practitioners, policy makers and decision makers, and academics.

## Goals, Objectives, Strategy, Budget, and Approach

### Goal and Objective

Consistent with past business plans, ASTAE's enduring goal is to contribute to poverty reduction and protection of the environment, as made operational through its unchanged objective, to “scale-up the use of sustainable energy options in Asia to reduce energy poverty and protect the environment.” ASTAE defines sustainable energy as energy security, sustainable sources of energy, continuous and reliable flows of energy supply, and financially sustainable energy for suppliers and users.

<sup>3</sup> Based on a review of literature from middle- and high-income countries, green growth is defined as sustainable development and growth in harmony with protection of the environment and ecosystem. Protection of the environment and ecosystem is an engine of growth and development rather than an obstacle. Green growth has the following characteristics:

- sustains economic growth;
- reduces environmental damage, including local pollution and greenhouse gas emissions;
- minimizes waste and inefficient use of natural resources;
- relies on energy-efficient and low-carbon energy resources and production technologies;
- builds sustainable infrastructure, such as compact urban form and public transport;
- promotes green technologies and creates new job opportunities; and
- educates and increases the awareness of citizens to adopt resource-efficient consumption patterns.

Green, low-carbon growth not only improves environmental sustainability, but brings additional benefits for development, such as enhanced energy security, less traffic congestion, more livable cities, and greater competitiveness from higher productivity, thus justifying part of its cost and increasing the appeal of green policies.

Sustainable energy options remain defined through the three ASTAE pillars:

- energy efficiency,
- renewable energy, and
- access to modern energy services.

ASTAE operational support will be implemented through four key approaches:

- supporting innovative delivery mechanisms,
- enhancing policy and regulatory frameworks,
- building capacity and sharing knowledge, and
- promoting cross-sectoral and regional collaboration for mitigation of, and adaptation to, climate change.

Articulation of the fourth approach is new, although ASTAE has been implementing this approach for some time. It has been added to emphasize ASTAE's increasing commitment to this approach.

### Specific Objectives of the Third Phase of ASTAE

As noted, ASTAE's specific objective in its early days was to mainstream alternative energy in lending and grants in the EAP. For ASTAE's second phase, the objective was scaling up, mainly on a country basis. In this third phase, the specific objective is promoting low-carbon, green growth,<sup>3</sup> and scaling up supply of and access to sustainable energy on a regional basis. ASTAE will devote special attention to supporting the promotion of sustainable energy as part of a regionwide system to create synergistic impacts and promote increased efficiency. The increasing importance of the regional dimensions of ASTAE's mission is reflective of external demand and opportunities and ASTAE's long-standing experience and capability.

#### *Low-carbon, green growth*

Promoting low-carbon, green growth calls for cross-sectoral work. First among the priority activities is ecologically and economically sustainable cities, which will require integrated land use planning, transport, building, other infrastructure services, and urban agriculture. Rural development will remain an area of focus, and will include creating synergies between renewable energy, food security, and water management.

### *Scaling up supply of and access to sustainable energy on a regional basis*

ASTAE's intra- and interregional activities will continue to address specific issues that are best handled at the supranational level. In addition to supporting regional projects as defined under IDA guidelines,<sup>4</sup> ASTAE will encourage South-South cooperation and knowledge sharing, and continue to support the regional, cross-border, and common (or similar) challenges faced by countries in the region. Past ASTAE-supported activities with regional dimensions generally followed four concepts:

- First are regional products, methodologies, and instructional frameworks shared by countries in the region. Examples include the popular EAP region's wind atlas, the carbon-emission-mitigation toolkit for road construction, and the institutional framework for efficient urban transportation.
- Second is replication of specific activities and concepts in neighboring countries. For example, both the cookstove program and the biodigester program developed in Cambodia were replicated in Lao PDR, with specific adaptations built on local Lao traditions.
- Third are training and study tours to neighboring countries as a component of World Bank lending and grant investment activities. These activities have been crucial for capacity building in client countries and South-South learning, as well as for North-South learning. In addition to study tours, regional conferences to share lessons learned and exchange knowledge were held, showcasing experiences from Bank investment activities and sometimes leading to future Bank investment activities.
- Fourth is the production of regional strategic studies that guide future World Bank investments. Among these studies are the EAP strategic flagship reports entitled "Winds of Change" to promote low-carbon, green growth, and "One Goal, Two Paths" to promote energy access in future Bank investments in the region.

### Strategy and Budget

ASTAE seeks to continue its successful work in the EAP while reengaging in the SAR. Consistent with its downstream-project and program-oriented focus, ASTAE will add RETF activities to the current BETF activities. Intervention at the national level will remain the core intent, but specific attention will be paid to opportunities to scale country practices up to regional status. At the same time, given the growth and importance

of cities and urbanization, ASTAE will also provide support at the subnational level. It will continue to seek cross-sectoral synergies whenever relevant to the ASTAE pillars, especially when they fit well with the cross-sectoral dimensions of low-carbon, green growth.

The estimated budget required to intensify the work in the EAP, to extend ASTAE activities into the SAR, and to support recipient-executed activities is at least US\$20 million over the next four fiscal years. ASTAE will allocate operational budget resources to intensify downstream activities related to sustainable energy projects and programs as shown in table 4-1.

IDA and non-IDA countries are likely to receive comparable budget allocations. The IDA countries are more numerous, but have smaller economies, thus requiring less resources per country. The non-IDA countries generally have larger economies and will require concomitantly higher proportional resources.

**Table 4-1: Indicative Operational Budget Allocation**

IDA countries	40 percent
Middle-income countries	30 percent
Regional work and knowledge-sharing activities	20 percent
Selective engagement with India and China	10 percent

The suggested target allocation per pillar is 50 percent for renewable energy, 25 percent for energy efficiency, and 25 percent for access to energy. Cross-sectoral and regional activities, including green growth, climate change, poverty, gender, and other social and environmental issues overlap among the three pillars (table 4-2).

**Table 4-2: Indicative Operational Budget Allocation by ASTAE Pillar**

Renewable energy	50 percent
Energy efficiency	25 percent
Energy access	25 percent

<sup>4</sup> Under IDA15 guidelines, regional projects are operations (i) that involve three or more countries, all of which need to participate for the project's objectives to be achievable; (ii) whose benefits, either economic or social, spill over country boundaries; (iii) where there is clear evidence of country or regional ownership that demonstrates commitment of the majority of participating countries; and (iv) that provide a platform for a high level of policy harmonization between countries, and importantly, that are part of a well-developed and broadly supported regional strategy. Starting with IDA16, the three-country requirement for regional projects was relaxed to allow two countries, of which at least one is a fragile or conflict-affected country, to be eligible for financing for regional IDA projects. The three-country criterion is retained for all other IDA countries.

Table 4-3 summarizes indicators ASTAE pledges to achieve for business plan FY2012–15, based on the lessons learned. Formal indicators are built on the basis of approved projects presented to the Bank’s Board of Directors during the business plan period. Only sustainable energy projects that benefit from ASTAE funding will be counted toward the pledged indicators. Additional indicators on possible cross-sectoral impacts may be considered.

**Table 4-3: Summary of Pledged Indicators for Business Plan FY2012–15**

Direct indicators	Unit	Value pledged
<b>1. TOTAL WORLD BANK LENDING CATALYZED BY ASTAE ACTIVITIES</b>		
Project and program lending	Million US\$	3,200
<b>2. NEW CAPACITY AND INCREASED GENERATION OF RENEWABLE ELECTRICITY</b>		
Renewable energy, capacity	MW	1,500
Renewable energy, generation	GWh/year	3,000
<b>3. ELECTRICITY SAVINGS RESULTING FROM EFFICIENCY IMPROVEMENTS</b>		
Energy savings, capacity	MW equivalent	1,000
Energy savings, generation	GWh/year	2,000
<b>4. HOUSEHOLDS WITH ACCESS TO MODERN ENERGY SERVICES</b>		
Access to electricity (new)	Households	2,000,000
Access to electricity (improved)	Households	1,000,000
Improved stoves for heating (cooking and space)	Households	5,000,000
<b>5. AVOIDED GREENHOUSE GAS EMISSIONS</b>		
Direct CO <sub>2</sub> avoided over 20 years	Million tons	200
<b>6. COUNTRIES BENEFITING FROM ASTAE SUPPORT</b>		
Number of countries	Countries	15

n.a. Not applicable.

“Direct” refers to values achieved, or expected to be achieved, in the course of World Bank–funded projects benefiting from ASTAE support.



# APPENDIXES

A RICE HULLER  
RUNNING A HYDRO  
MILL.

## Appendixes to Annual Status Report

### APPENDIX 1: ASTAE COUNTRIES AT A GLANCE: REGION MAP AND PILLAR-RELATED STATISTICS

The map in appendix figure 1-1 shows the partner countries where ASTAE operates in the South Asia and East Asia and Pacific Regions.

Appendix Figure 1-1: ASTAE Presence in the South Asia and the East Asia and Pacific Regions



IBRD 28347  
 JANUARY 2011  
 This map was produced by the Map Design Unit of the World Bank. The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of the World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.

Appendix table 1-1 provides data to illustrate the diversity of South Asia and East Asia and Pacific countries in the context of ASTAE pillars. These data are not updated regularly by any centralized entity, and some were not available for the most recent years. They are primarily sourced from the U.S. Department of Energy's Energy Information Administration (EIA), internal World Bank data, and the International Energy Agency (IEA). Although the best comparisons could be made if all data were for the same year, data for the most current year are provided whenever possible. The footnotes to the table provide further details.

**Appendix Table 1-1: Background Data Providing Context to ASTAE Pillars**

Region and countries of activity	Basic context		First pillar: renewable energy				Second pillar: energy efficiency		Third pillar: access		Greenhouse gas emissions			
	Population (WB 2008)	GDP (WB 2008)	Installed capacity, electricity (EIA 2008)	Annual electricity generation (EIA 2008) <sup>a</sup>	Installed capacity, renewable (EIA 2008)	Share of generation using renewable (EIA 2008)	Energy intensity in the economy <sup>b</sup> (EIA 2008)	Energy Intensity in power production (IEA 2008)	Population without electricity (WB 2010)	Electrification rate (World Bank, IEA 2010)	Annual energy-related CO <sub>2</sub> emission and ranking (EIA 2008)		Annual per capita energy related CO <sub>2</sub> emission and ranking (2009)	
	Million	Billion US\$	MW	TWh	MW	%	tCO <sub>2</sub> / US\$1,000 GDP	tCO <sub>2</sub> / MWh	Million	%	Million ton	Out of 189	ton / capita	Out of 189
<b>EAST ASIA AND PACIFIC</b>														
Cambodia	14.7	11.2	386	1.4	18	4	0.48	1.150	11.2	24	4	132	0.28	165
China	1,330.1	5,926.6	797,078	3,221.2	186,820	17	2.21	0.760	13.3	99	7,707	1	5.82	59
Indonesia	228.2	706.6	27,802	141.2	5,801	14	1.16	0.730	79.9	65	415	16	1.73	116
Lao PDR	6.4	7.3	723	4.0	673	92	0.32	—	1.9	70	1	164	0.20	172
Mongolia	3.1	6.2	832	3.9	0	0	2.46	0.540	0.3	90	7	107	2.43	104
Papua New Guinea	6.4	9.5	699	3.0	271	30	0.81	—	6.0		5	122	0.82	139
Philippines	99.8	199.6	15,680	57.4	5,283	34	0.68	0.460	16.0	84%	72	45	0.74	144
Thailand	67.4	318.5	40,669	139.0	3,487	8	1.27	0.530	0.7	99	254	25	3.82	79
Vietnam	89.6	106.4	13,850	70.0	5,500	37	1.41	0.430	3.6	96	98	39	1.11	129
<b>SOUTH ASIA</b>														
Afghanistan	29.1	17.1	489	0.8	—	—	0.08	—	25.3	13	1	171	0.03	189
Bangladesh	156.1	100.2	5,453	32.9	230	4	0.75	0.570	79.6	49	55	55	0.36	158
Bhutan	0.7	1.5	1,505	7.1	1,498	99	0.35	—	0.3	56	—	—	0.48	153
India	1,173.1	1,727.1	177,376	785.5	51,363	50	1.40	0.950	398.9	66	1,591	3	1.38	123
Nepal	29.0	12.0	717	3.1	660	99	0.35	0.030	16.5	43	3	134	0.12	179
Pakistan	184.4	176.9	19,769	87.7	6,464	31	1.08	0.430	70.1	62	140	33	0.77	141
Sri Lanka	21.5	49.6	2,645	8.9	1,360	46	0.45	0.380	4.9	77	13	92	0.59	149
<b>SMALL ISLAND COUNTRIES</b>														
Fiji	0.9	3.5	216	0.9	95	71	0.74	—	0.2	75	2	144	2.56	99
Maldives	0.4	1.9	106	0.3	—	—	0.94	—	—	99	1	169	2.32	104
Solomon Islands	0.6	0.7	14	0.1	0	0	0.55	—	0.5	18	—	—	0.53	150
Samoa	0.2	0.6	41	0.1	12	46	0.36	—	—	97	—	—	0.77	142
Timor-Leste	1.2	0.7	—	—	—	—	0.98	—	0.9	22	—	—	0.27	157
Vanuatu	0.2	0.7	12	0.0	0	0	0.28	—	0.1	27	—	—	0.53	149
<b>WORLD INDEX</b>														
World	6,853.0	63,123.0	4,624,767	19,103.2	1,056,413	19	0.61	0.510	1,302.1	81	30,313	—	4.47	Equiv. 69

Appendix Table 1-1: Background Data Providing Context to ASTAE Pillars

Region and countries of activity	Basic context		First pillar: renewable energy				Second pillar: energy efficiency		Third pillar: access		Greenhouse gas emissions			
	Population (WB 2008)	GDP (WB 2008)	Installed capacity, electricity (EIA 2008)	Annual electricity generation (EIA 2008) <sup>a</sup>	Installed capacity, renewable (EIA 2008)	Share of generation using renewable (EIA 2008)	Energy intensity in the economy <sup>b</sup> (EIA 2008)	Energy Intensity in power production (IEA 2008)	Population without electricity (WB 2010)	Electrification rate (World Bank, IEA 2010)	Annual energy-related CO <sub>2</sub> emission and ranking (EIA 2008)		Annual per capita energy related CO <sub>2</sub> emission and ranking (2009)	
	Million	Billion US\$	MW	TWh	MW	%	tCO <sub>2</sub> / US\$1,000 GDP	tCO <sub>2</sub> / MWh	Million	%	Million ton	Out of 189	ton / capita	Out of 189
<b>DEVELOPING ASIA SHARE OF TOTAL</b>														
Developing Asia share	50.2%	14.9%	23.9%	23.9%	25.5%	—	—	—	56.1%	—	34.2%	—	—	—
EAP share	27.0%	11.6%	19.4%	19.1%	19.7%	—	—	—	10.3%	—	28.3%	—	—	—
SAR share	23.3%	3.3%	4.5%	4.8%	5.8%	—	—	—	45.7%	—	6.0%	—	—	—

## Sources:

- GDP: World Bank 2010 (current US\$).
- Electrification rate: World Bank and IEA data 2010.
- CO<sub>2</sub> emissions: EIA 2009.
- Ranking of CO<sub>2</sub> emissions: ASTAE, using EIA 2009 data.
- All other indicators: EIA 2009 (or 2008 when 2009 not available).
- Asia share of total: ASTAE calculations using all above-mentioned sources.

Note: —Data not available.

- a. Countries with 2009 generation data available: China 3,446 TWh, India 835 TWh.  
 b. Calculated using 2005 US\$ market exchange rates.

## APPENDIX 2: LINK BETWEEN BANK PROJECTS AND ASTAE INDICATORS IN FISCAL 2011

Appendix table 2-1 links all ASTAE activities for which funds were disbursed in fiscal 2011 to the related World Bank projects, and shows their contribution to the global ASTAE indicators discussed in chapter 3.

Appendix Table 2-1: Link between Bank Projects and ASTAE Indicators, FY2011

ASTAE Activity	Type and details of activity		Indicators				
			Installed new renewable-energy generation capacity	Energy savings (electric)	Access households	CO <sub>2</sub>	Origin of indicator
		PERIOD TOTAL					
<b>BANGLADESH</b>							
1	Strengthening Rural Electrification Service Delivery in Bangladesh	PE: IBRD-IDA project • Provide technical support to the government to develop a time-bound action plan to meet the target of universal access by 2021	-	-	-	-	-
<b>CAMBODIA</b>							
2	Biodigester Private Sector Development Phases I and II	TA: Technical Assistance • Define a service-delivery model and licensing procedures for private biodigester construction companies, support the emergence of such companies, and create a trade association • Under Phase II, scale up the number of companies formed and ensure their long-term viability	-	-	17,500 (improved)	76,713 t/year	ASTAE Proposal and World Bank Project Information Document
<b>CHINA</b>							
3	China Renewable Energy Scale-up Program (CRESP-II)	PE: IBRD-IDA project • Provide support to project implementation unit • Provide support to Shanghai low carbon city	-	-	-	-	-
4	Urban Transport Climate Change Strategy	ESW: Economic and Sector Work • Review energy and carbon footprint of urban transport • Disseminate best practices on energy-efficiency and energy-security concerns in the urban transport sector	-	-	-	-	-
5	Energy Efficiency Financing Promotion	TA: Technical Assistance • Draft an operations manual for IBRD loan on-lending to Chinese banks for energy efficiency projects • Determine eligibility of subprojects for financing, preparation procedures and appraisal, implementation arrangements, and general terms of subloans • Develop a draft monitoring and reporting system	-	-	-	10 million tons (direct) 94 million tons (indirect)	World Bank Project Appraisal Document
<b>FIJI</b>							
<b>INDIA</b>							
6	Energy Efficiency in Small and Medium Enterprises (SMEs)	GE: GEF Grant • Raise awareness and build capacity in energy efficiency in SMEs • Increase capacity of local bank branches to identify and appraise energy-efficiency projects	-	-	-	4.8 million tons	World Bank Project Appraisal Document
7	Electrification and Renewable Energy Study	TA: Technical Assistance • Skill gap analysis in renewable energy in the power sector in India • Guidance note for a national action plan on rural feeder segregation	-	-	-	-	--
<b>INDONESIA</b>							
8	Geothermal Power Support Program	TA: Technical Assistance • Assist in review, design, and consensus building for policy reforms in the geothermal sector • Enhance government's capacity to integrate Clean Development Mechanism in geothermal development • Assist in identifying and preparing geothermal projects to be financed by World Bank loan	260 MW (direct) 6,000 MW (indirect)	-	-	21 million tons (direct) 500 million tons (indirect)	ASTAE Proposal and World Bank Project Information Document



Appendix Table 2-1: Link between Bank Projects and ASTAE Indicators, FY2011

ASTAE Activity	Type and details of activity		Indicators				
			PERIOD TOTAL	Installed new renewable-energy generation capacity	Energy savings (electric)	Access households	CO <sub>2</sub>
<b>INDONESIA</b>							
9	Thousand islands solar PV	PE: IBRD-IDA project • Rapid assessment of utility's capacity to implement 1,000 islands electrification program • Inform utility of level of data information required to request World Bank support	Not yet determined	-	Not yet determined	-	-
<b>LAO PDR</b>							
10	Lessons from the Lao rural electrification program	KP: Knowledge Product • Identify factors that contributed to electrification successes • Advise government on next steps toward universal access	-	-	37,700 (new, direct)	-	World Bank Project Appraisal Document
<b>MONGOLIA</b>							
11	Energy Sector Project	PE: IBRD-IDA project • Efficiency improvement in the electricity distribution system • Greater awareness and capacity among stakeholders	-	-	-	-	-
<b>PACIFIC ISLANDS</b>							
<b>PHILIPPINES</b>							
<b>SOLOMON ISLANDS</b>							
12	Tina River Hydropower Development Project	TA: Technical Assistance • Provide technical and methodological support to help the Solomon Islands government prepare a proposed hydropower development project	-	-	-	-	-
<b>THAILAND</b>							
<b>TIMOR-LESTE</b>							
13	Energy Service Delivery Project	TA: Technical Assistance • Preparation of the Rural Electrification Master Plan • Pre-investment study for project preparation	-	-	-	-	-
14	Rural Energy Access and Efficiency	TA: Technical Assistance • Help prepare an integrated pre-investment package with - Solar photovoltaic dissemination options - Candidate micro-hydro sites - Improved stoves models	-	-	-	-	-
<b>TONGA</b>							
<b>VIETNAM</b>							
15	Documentary on Rural Electrification	KP: Knowledge Product • Documentary on rural electrification in Vietnam prepared for television broadcasting	-	-	-	-	-

## APPENDIX 2: LINK BETWEEN BANK PROJECTS AND ASTAE INDICATORS IN FISCAL 2010

Appendix Table 2-1: Link between Bank Projects and ASTAE Indicators, FY2011

ASTAE Activity	Type and details of activity	Indicators					
		PERIOD TOTAL	Installed new renewable-energy generation capacity	Energy savings (electric)	Access households	CO <sub>2</sub>	Origin of indicator
<b>VIETNAM</b>							
16	Rural Electrification Impact Studies	TA: Technical Assistance <ul style="list-style-type: none"> <li>• Analysis of the impact of rural electrification using data from two field surveys conducted in 2002 and 2005</li> <li>• Improvement of implementation design of rural electrification projects</li> </ul>	-	-	-	-	-
17	Renewable Energy Development Project	TA: Technical Assistance <ul style="list-style-type: none"> <li>• Preparation and supervision of the Vietnam Renewable Energy Development Project</li> </ul>	180 MW	-	150,000 (Improved)	8.4 million tons	World Bank Project Information Document and ASTAE Proposal
18	Support for the Vietnam Energy Efficiency Demand Side Management program	TA: Technical Assistance <ul style="list-style-type: none"> <li>• Provide advisory assistance and capacity building to Ministry of Industry</li> <li>• Conduct workshops on business collaboration between Vietnamese and international ESCOs</li> <li>• Identify opportunities for expansion of commercial energy-efficiency business</li> </ul>	-	-	-	-	-
19	Rural Distribution Project	PE: IBRD-IDA project <ul style="list-style-type: none"> <li>• Support the preparation of plans for completing government of Vietnam's program for universal electrification</li> <li>• Build capacity of the power companies to act as independent participants in the power market</li> </ul>	-	-	-	-	-
20	System Efficiency Improvement, Equitization and Renewables	TA: Technical Assistance <ul style="list-style-type: none"> <li>• Policy and regulatory work to enable small hydro investments</li> </ul>	-	-	-	-	-
<b>REGIONAL PROJECTS, OUTREACH AND KNOWLEDGE SHARING</b>							
21	Regional: Carbon Emission Mitigation Toolkit for Highway Construction	KP: Knowledge Product <ul style="list-style-type: none"> <li>• Analyze activities associated with design, construction, and rehabilitation of highway projects and identify those sensitive to energy consumption and carbon emissions</li> <li>• Estimate carbon footprint and provide mitigation options</li> </ul>	-	-	-	Up to 200 tons/km built	ASTAE Proposal estimate and World Bank Project Information Document
22	Regional: East Asia Pacific Flagship Study	KP: Knowledge Product <ul style="list-style-type: none"> <li>• Analysis of regional potential of renewable-energy sources and energy-efficiency improvements</li> <li>• Review of existing policies and identification of gaps</li> <li>• Recommendations for regional policy development</li> </ul>	-	-	-	-	-



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## APPENDIX 3: ASTAE DONORS, RESOURCE USE, AND FUNDING EVENTS

### ASTAE Donors

ASTAE currently relies on the Netherlands and Sweden as donor countries for its budget, as well as on matching funds from the World Bank (see the section "ASTAE Resource Use" below). Previous ASTAE donors include Australia, Canada, Finland, Japan, Switzerland, the United Kingdom, and the United States.

#### The Netherlands: Ministry of Foreign Affairs (Development Cooperation)

ASTAE's principal funding source is currently the Netherlands, through its Ministry of Foreign Affairs (Development Cooperation). The Netherlands is a founding donor as well as a core ASTAE donor, and since 1993 has contributed reliably to ASTAE's capacity to engage in sustained activities. The funding agreement for the business plan period ending in fiscal 2011 was signed in 2006 for US\$7.4 million.

The Web site for the Ministry of Foreign Affairs is <http://www.minbuza.nl/en>.

#### Sweden: Swedish International Development Agency

Sweden joined ASTAE donors in 2007 with a grant of SKr 15 million (US\$2.0 million), which enabled the extension of ASTAE activities under the business plan and to regional and cross-sector activities.

The Web site for the Swedish International Development Agency is <http://www.sida.se/English/>.

### ASTAE Resource Use

ASTAE used donor funds totaling US\$2,603,947 in fiscal 2011. Complementary World Bank resources for ASTAE-supported projects totaled US\$1,301,789 in fiscal 2011.

ASTAE has used US\$34.3 million in donor funds since 1992, an amount matched by the World Bank with US\$32.2 million during the same period. Details of resource use by year are in appendix table 3-1.

**Appendix Table 3-1: Resource Use, World Bank and Donors, FY1992–2011**

YEAR	DONORS		WORLD BANK		TOTAL	
	US\$	%	US\$	%	US\$	%
FY92	108,000	32	226,400	68	334,400	100
FY93	827,087	66	419,100	34	1,246,187	100
FY94	1,399,635	67	688,100	33	2,087,735	100
FY95	1,309,063	56	1,046,000	44	2,355,063	100
FY96	2,057,058	56	1,618,924	44	3,675,982	100
FY97	1,705,817	59	1,197,128	41	2,902,945	100
FY98	1,617,777	59	1,126,683	41	2,744,460	100
FY99	1,782,576	61	1,156,346	39	2,938,922	100
FY00	2,627,480	63	1,524,004	37	4,151,484	100
FY01	955,281	46	1,106,035	54	2,061,316	100
FY02	2,108,541	66	1,106,035	34	3,214,576	100
FY03	2,205,111	64	1,239,633	36	3,444,744	100
FY04	1,014,358	25	3,013,893	75	4,028,251	100
FY05	2,704,306	44	3,450,703	56	6,155,009	100
FY06	1,959,983	38	3,169,070	62	5,129,053	100
FY07	1,216,589	30	2,827,968	70	4,044,557	100
FY08	1,847,757	45	2,258,369	55	4,106,126	100
FY09	2,177,200	53	1,915,042	47	4,092,242	100
FY10	2,123,893	54	1,820,321	46	3,944,214	100
FY11	2,603,947	67	1,301,789	33	3,905,736	100
<b>TOTAL</b>	<b>34,351,459</b>	<b>52</b>	<b>32,211,543</b>	<b>48</b>	<b>66,563,002</b>	<b>100</b>

Appendix Table 3-2: Principal ASTAE Funding Events since 2004

YEAR	MONTH	AGENCY	EVENT	AMOUNT (US\$)
2004	March		ASTAE Donors Meeting # 13	
	March	U.K.	DFID Tranche #6	363,351
	March	Canada	CIDA Tranche #2	563,562
	May	Netherlands	Commitment ASTAE Phase 3 Funding 2004-6 (€ 3.3)	(4,000,000)
	October	Canada	CIDA Tranche #3	591,871
2005	January	Netherlands	Dutch Partnership Trust Fund Phase 3 Tranche # 1	1,454,500
	February	Canada	CIDA Tranche #4	202,544
	March		ASTAE Donors Meeting # 14	
	May	Netherlands	Commitment for ASTAE II Funding 2006 - 2008	
2006	March		ASTAE Donors Meeting # 15	
	May	Netherlands	BNPP Agreement signed for ASTAE II, 2006 - 2009	(7,424,400)
	July	Netherlands	BNPP Tranche #1, ASTAE II	2,598,540
2007	March	Germany	ASTAE Donors Meeting# 16	
		Sweden	Commitment by Swedish International Development Agency Commitment (SKr 15 million eq. 2,355,000 USD at that date)	1,868,725
	December	Netherlands	BNPP Tranche #2 - ASTAE II	1,113,660
2008	February	USA	ASTAE Donors Meeting # 17	
	February	Sweden	First Tranche of Sida Commitment	553,435
	June	Netherlands	BNPP Tranche #3 - ASTAE II	1,856,069
2009	April	USA	ASTAE Donors Meeting # 18	
	February	Sweden	Second Tranche of Sida Commitment	436,620
		Australia	Commitments to fund projects in Cambodia and Lao PDR, starting in FY10	
	June	Netherlands	BNPP Tranche #4 - ASTAE II	1,856,069
2010	April	USA	ASTAE Donors Meeting # 19	
	January	Sweden	Third Tranche of Sida Commitment	389,414
	June	Sweden	Fourth Tranche of Sida Commitment	489,256
	December	Netherlands	ASTAE-II Trust Fund closing	
2011	February	Sweden	ASTAE Sida Trust Fund closing	
	February	World Bank	ASTAE Multi-Donor Trust Fund (MDTF) created	
	March	USA	ASTAE Donors Meeting # 20	
	March	Netherlands	Ministry of Foreign Affairs commitment to MDTF for \$12 million over four years confirmed	
	April	Netherlands	ASTAE-II Trust Fund end of disbursements	
	June	Sweden	ASTAE Sida Trust Fund end of disbursements	

## APPENDIX 4: ASTAE-SUPPORTED WORLD BANK INVESTMENT PROJECTS IN EAP

Appendix Table 4-1: ASTAE-Supported World Bank Investment Projects

Country	Projects		Approval End date (Est.)	Sustainable Energy Project Cost (\$million)					Primary Project Component		
				Total cost	Source of financing						
					IBRD/ IDA	GEF	Govt.	Private		Other	
<b>PROJECTS UNDER IMPLEMENTATION</b>											
FY02	1	Vietnam	System Efficiency Improvement, Equitization, and Renewables	06/02-FY12	24.5	17.2	4.5	2.8		Renewable energy and DSM	
FY04	2	Philippines	Rural Power	12/03-FY12	26.7	10.0	9.0	0.2	7.5	Renewable energy for rural applications	
	3	Cambodia	Rural Electrification and Transmission	12/03-FY12	32.0	16.0	5.8		10.2	Renewable energy for rural applications	
	4	Philippines	Power System Loss Reduction	06/04-FY14	62.3		12.0	0.3	50.0	Rural electrification & efficiency	
FY05	5	Vietnam	Rural Energy II	11/04-FY14	329.5	220.0	5.3	70.0	35.0	Renewable energy for remote communities	
	6	China	Heat Reform and Building Efficiency	03/05-FY12	52.6		18.0	0.9	33.7	Energy efficiency	
FY06	7	China	Renewable Energy Scale-Up Program Phase 1B	01/06-FY12	132.4	86.3		30.1	16.0	Wind farm and small hydro	
	8	Lao PDR	Lao PDR Rural Electrification Phase I (SPRE II)	04/06-FY12	36.3	10.0	3.7	8.2	14.3	Renewable energy for rural application	
FY07	9	Mongolia	Renewable Energy and Rural Electricity	01/07-FY12	23.0	3.5	3.5	10.0	6.0	Renewable energy and rural electricity access	
	10	Timor-Leste	Gas Seep Harvesting	03/07-FY12	1.5	0.9	0.6			Gas seep for power generation	
	11	Timor-Leste	Energy Service Delivery	06/07-FY12	8.5	4.5		2.0	2.0	Loss reduction, RE development, and community-based access	
	12	Pacific Islands	Sustainable Energy Financing	05/07-FY12	58.5		9.5	20.2	22.1	6.7	Renewable energy scaling up
FY08	13	Indonesia	Geothermal Power Generation Development	05/08-FY13	9.0		4.0	5.0		Geothermal power scaling up and capacity building	
	14	China	Energy Efficiency Financing	05/08-FY13	593.6	200.0	13.5	6.3	373.8	Energy efficiency for industry	
	15	China	Liaoning Third Medium Cities Infrastructure	05/08-FY13	375.9	191.0		184.9		Improve efficiency of heating and gas services	
	16	Vietnam	Rural Distribution	05/08-FY12	204.2	150.0		54.2	3.0	Electricity network efficiency improvement	
FY09	17	Solomon Islands	Solomon Islands Sustainable Energy	07/08-FY13	4.5	4.0		0.5		Electricity loss reduction and increased access	
	18	Philippines	Additional Financing for Rural Power	04/09-FY13	48.4	40.0	0.5		7.9	Renewable energy for rural applications	
	19	Vietnam	Renewable Energy Development	05/09-FY15	318.0	202.0		64.0	49.7	2.3	Increase RE share in electricity mix, TA and lending
	20	China	Thermal Power Efficiency	05/09-FY16	109.0		19.7	15.5	73.8	Efficient dispatch and increased thermal plants efficiency	
	21	Vietnam	Rural Energy II - Additional Financing	05/09-FY16	250.6	200.0		38.8		11.8	Improved and new electricity access
FY10	22	China	Energy Efficiency Financing II	06/10- FY15	101.6	100.8		0.8		Catalyze commercial investments in industrial energy efficiency	
	23	India	Financing Energy Efficiency in SMEs	05/10-FY14	57.6		11.3	0.3	46.0	Increased energy efficiency in small and medium enterprises	
	24	Lao PDR	Rural Electrification II	01/10-FY14	37.6	24.4	1.8	4.0	3.4	4.0	Increase rural households' access to electricity
	25	Vietnam	System Efficiency Improvement, Equitization and Renewables, additional financing	06/10- FY13	3.5	3.5					Renewable energy and demand-side management
<b>PROJECTS UNDER IMPLEMENTATION</b>											
FY11	No ASTAE-supported Bank projects were approved in FY11										
Total Current Fiscal Year					-	-	-	-	-		
Total Projects under Implementation					2,848	1,484	123	519	620	159	

Appendix table 4-1 lists World Bank projects that have benefited from ASTAE support since its inception. It provides details on ASTAE's World Bank investment leverage (illustrated in figure 1-2).

**Appendix Table 4-1: ASTAE-Supported World Bank Investment Projects**

Country	Projects	Approval End date (Est.)	Sustainable Energy Project Cost (\$million)					Primary Project Component		
			Total cost	Source of financing						
				IBRD/ IDA	GEF	Govt.	Private		Other	
<b>CLOSED PROJECTS</b>										
1	Lao PDR	Provincial Grid Integration	10/92–01/00	0.9	0.9					DSM, institution building
2	Thailand	Distribution System and Energy Efficiency	04/93–06/00	59.3		8.0	20.3		31.0	DSM, capacity building
3	Indonesia	Second Rural Electrification	02/95–09/00	19.3	13.3		6.0			Minihydro, geothermal resource assessment, and TA
4	Vietnam	Power Development	02/96–06/00	1.6	0.5				1.1	Renewable energy capacity building
5	Indonesia	Solar Home Systems	01/97–06/04	3.4	0.1	2.3		1.0		Solar home systems and TA
6	Thailand	Metropolitan Distribution Reinforcement	06/97–06/04	4.0			2.5		1.5	DSM, capacity building
7	Lao PDR	Southern Provinces Rural Electrification	03/98–06/04	2.2	1.0	0.7	0.5			Solar battery charging and microhydro projects
8	China	Passive Solar Heating for Rural Health Clinics	06/01–06/04	1.5		0.8	0.8			Energy efficient building design
9	China	Energy Conservation	03/98–6/06	150.8	63.0	22.0	7.0	54.3	4.5	Energy efficiency, TA
10	Vietnam	Transmission, Distribution, and Disaster Reconstruction	01/98–06/07	3.3			0.5		2.8	DSM capacity building, equipment standards
11	China	Renewable Energy Development	01/98–06/07	205.4	13.0	27.0		165.4		Wind farms, PV, PV technology improvement
12	Vietnam	Rural Energy I	05/00–12/06	2.5	1.0				1.5	Renewable energy, TA, & pilot minihydro
13	China	Hebei Urban Environment	06/00–06/08	5.0	4.0		1.0			Energy efficiency in water utilities
14	China	Energy Conservation II	10/02–06/10	242.5		26.0		216.5		ESCO market development
15	Vietnam	Demand-Side Management	06/03–06/10	18.6		5.5	1.2	6.7	5.2	DSM support
16	China	Renewable Energy Scale-Up Program	06/05–09/10	336.0	87.0	40.2	142.0		67.0	Renewable energy and energy efficiency
17	Papua New Guinea	Teachers Solar Lighting Project	06/05–08/10	2.9		1.0	0.1	1.7	0.1	Renewable energy (PV) for teachers in rural areas
<b>TOTAL CLOSED PROJECTS</b>				<b>720</b>	<b>97</b>	<b>92</b>	<b>40</b>	<b>444</b>	<b>48</b>	



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