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SECTION 4

OPPORTUNITIES AND BARRIERS FOR THE SCALE-UP OF CLEAN ENERGY OPTIONS

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OPPORTUNITIES AND BARRIERS FOR THE SCALE-UP OF CLEAN ENERGY

This section provides an overview of key issues and barriers that are relevant to the scale-up of clean energy in Asia. Several analyses of the issues and barriers related to renewable energy and energy efficiency development already exist.[1] This section explores practical examples from the focus countries and highlights potential solutions for promoting broad-based clean energy investments. The section draws from the published literature and consultations with stakeholders in the focus countries, including the private sector, as well as from a review of ongoing clean energy programs in these countries that cover energy efficiency in end-use and supply, renewable energy, and clean transport (see Country Reports, Annexes 1-6).

The barriers identified in this section are drawn largely from a series of roundtables in the focus countries, which were attended by government officials, private sector equipment and service providers, energy researchers and experts, and non-governmental agencies working in clean energy. The fact-finding effort also involved meetings with US government, non-government, and private-sector stakeholders active in clean energy in Asia. This section focuses on the most common sets of barriers experienced regionally across the six focus countries, as well as on opportunities for regional approaches to address and remove barriers.

4.1 KEY ISSUES AND BARRIERS

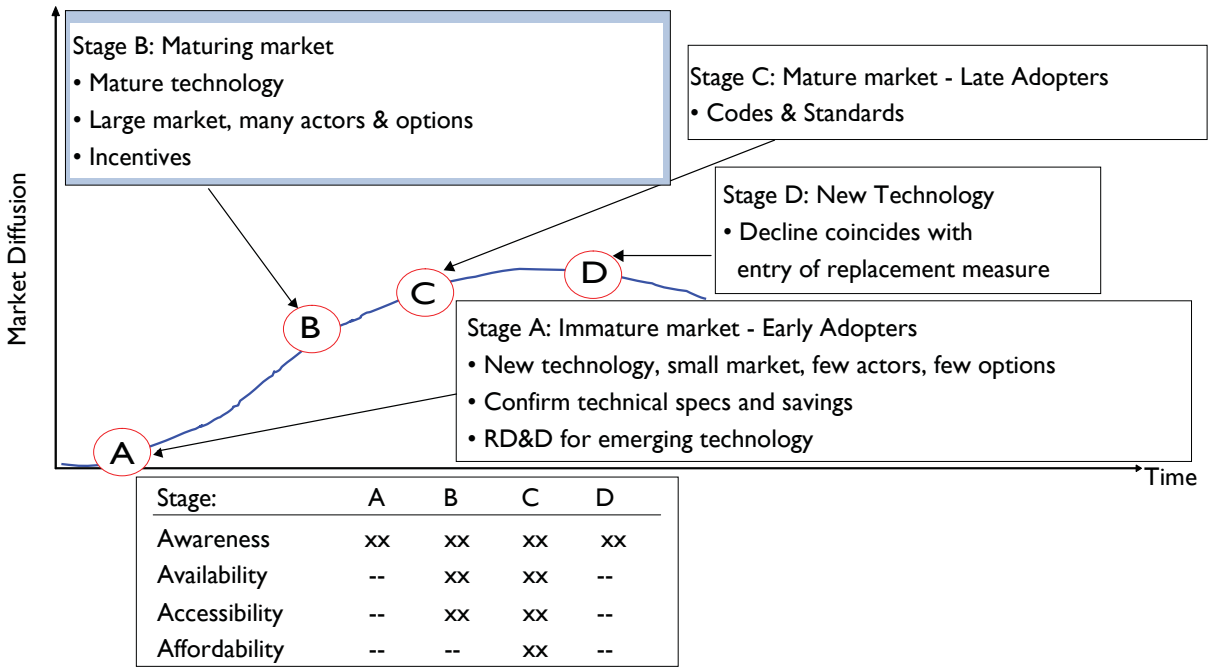
In order to understand the way that interventions can catalyze market transformations, it is useful to have a conceptual framework for technology adoption. Figure 28 (next page) provides such a framework,[2] with market development for clean energy divided into four distinct stages: immature market, maturing market, mature market, and post-mature market. Given the relative "youth" of clean energy developments in developing Asian economies, most of the barriers encountered relate to immature and maturing markets, and focus primarily on awareness, availability, and accessibility.

This section discusses and highlights opportunities and barriers for clean energy in Asia in the following areas:

- policy and regulatory frameworks;
- institutional design and capacity;
- market development and technology transfer;
- financial and regulatory incentives;
- access to financing;
- carbon markets and greenhouse gas reporting; and
- capacity building and information transfer.

1. Selected references include Painuly and Fenhann, 2002; WEC; 2000; ADB, 2006.
2. Friedman (2005) proposed this framework for EE technologies. However, the same is broadly applicable to the most clean energy technologies and systems.

FIGURE 28. TECHNOLOGY ADOPTION CURVE FOR CLEAN ENERGY TECHNOLOGY AND KEY BARRIERS TO ADOPTION



Stage:	A	B	C	D
Awareness	xx	xx	xx	xx
Availability	--	xx	xx	--
Accessibility	--	xx	xx	--
Affordability	--	--	xx	--

Source: Adapted from Friedmann (2005). Note: RD&D = Research Development and Demonstration.

4.2 POLICY AND REGULATORY FRAMEWORKS

Effective implementation and scale-up of clean energy options depends on stable, clear, consistent policies and proper planning on the part of governments. Asian countries are promulgating a wide array of laws, policies, declarations, and decrees that will guide energy sector expansion in the coming decades. Attachment 6 provides an overview of clean energy policies in Asia categorized into three areas: energy efficiency in end-use and supply, renewable energy, and clean transport. Several of these, such as China's recent renewable energy law (2006), are extremely ambitious and promise to finally bring renewable energy into the mainstream.

In many cases, these broad overarching laws have not been followed by the speedy development of complementary implementing regulations and guidelines that would help achieve the goals enshrined in the law. For example, Thailand has set an ambitious target to increase its share of renewable energy in the primary energy mix to eight percent, but it has taken several years to put in place implementation rules, bidding documents, and incentives. Furthermore, in many cases, the implementing authority for issues related to specific aspects within the energy sector is often dispersed among a myriad of departments and agencies, leading to poor coordination and less-than-desirable outcomes. More often than not, governments lack the political will to implement the policies that are already in place. For example, it is uncertain if the new set of coal-fired power plants being commissioned by the Indonesian utility, PLN, will be in compliance with existing Indonesian pollution control laws on SO_X and NO_X emissions.

Asian policymakers need a sustained effort to support the design, implementation, enforcement, and evaluation policies and programs that are well integrated to address near-term issues while paving the way for a more sustainable future. This depends on collaborative action, sharing of best practices, and cross-sectoral planning. For example, in the power sector, countries need to ensure that planned coal expansion adheres to the best available energy efficiency and environmental performance standards, while also creating the investment climate that facilitates expansion of the role of energy efficiency measures, biomass, wind, solar, and geothermal energy. Similarly, in the transport sector, policymakers should be putting in place clean energy measures that would immediately deliver the estimated 5 to 17 percent potential improvements in energy efficiency and air quality (ADB, 2006), while fostering more long-term and permanent sustainable transport solutions, including the wide-spread substitution of "second-generation" biofuels produced in a sustainable fashion.

PRIMARY BARRIERS IDENTIFIED

The team's research and consultation missions to the focus countries identified the following primary barriers to policy and regulatory frameworks:

- lack of training and preparation in the detailed design of implementing rules and regulations for government programs that mandate and guide clean energy development;
- limited knowledge and regular updates on the status and progress of clean energy policies and programs in other countries in the region; and
- resulting undeveloped legal and regulatory frameworks, limited institutional capacity, and excessive bureaucratic procedures.

HOW DELHI CLEARED THE AIR WITH THE USE OF CNG IN BUSES

Background

- In the early 1990s, Delhi was the fourth most polluted city in the world.
- 60-70 percent of total pollution in Delhi was attributed to transportation.
- Phase-out of leaded gasoline was introduced, along with the introduction of pre-mixed fuels for two-stroke engines and phase-out of 15-year-old commercial vehicles that were non-compliant.
- Poor enforcement of emission standards rendered them ineffective, and there was rampant fuel adulteration and non-compliance with transport and emission regulations.
- State and local governments were unwilling to undertake bold action to implement proposed reforms.
- With an increase in the number of vehicles, Delhi's air quality further deteriorated.
- Institutional and political realities in India made CNG the only option, albeit not the cheapest option.

Sequence of events

- Supreme Court mandated that all new buses registered must only be fueled by CNG.
- Following initial apprehension about lack of CNG pipelines and filling stations, manufacturers were unwilling to manufacture CNG vehicles without demonstrated demand.
- On 6 April 2002, nearly 7,000 diesel buses (50 percent of the fleet) were taken off the road after missing the Court deadline.
- By December 2002, all diesel city buses had been converted to CNG.

The enabling environment

- The Indian Supreme Court took charge when legislative and regulatory agencies would not or could not.
- The Delhi Government complied with court orders.
- An active NGO community and a free press helped create public awareness and support.

Source: Bell, 2004

4.3 INSTITUTIONAL DESIGN AND CAPACITY

A significant barrier encountered by many countries in developing Asia is that the design of their governmental energy institutions does not support a broad and aggressive approach to scaling-up clean energy.

"Barriers to scaling-up clean energy projects are created by the lack of consistency of state regulatory policy on renewable energy. This shows up in disparities and lack of an analytic basis for the relative pricing of various forms of renewable energy."

FINANCIER, INDIA

The adoption of the North America-inspired demand-side management (DSM) model, in some Asian countries, provides a good example of effective versus ineffective institutional design. For example, in Thailand, the electric utility operates a national DSM program focused on appliance and equipment efficiency, while the government operates a facility-based program focusing on large factories and buildings. This has led to some overlap and inefficiencies in program administration and outreach.[3] In addition, for institutional reasons, there has been slow progress in the area where the greatest potential for energy savings exists: minimum energy performance standards (MEPS) for electrical appliances and equipment. As a result, even though Thailand proposed its first MEPS in 1999, it will announce only its second MEPS by the end of 2006.[4] Thailand has just decided to create a new agency, the National DSM Agency, during 2007, to try to coordinate its energy efficiency and DSM activities. It is still too early to predict the effectiveness of this arrangement.

In Vietnam, there is a similar overlap between activities carried out by different agencies focused on DSM and on facility-based energy efficiency. Electricity of Vietnam (EVN) is implementing a national DSM program on energy efficient lighting, focusing on compact fluorescent lamps and thin-tube fluorescent lamps. Meanwhile, the Ministry of Industry (MOI) has been charged with developing a labeling scheme for those same lamps, and as a result the overall approach to regulating and promoting energy efficient lighting products has not been integrated. MOI is also implementing a commercial energy efficiency program that provides financial incentives for factories to invest in energy-saving equipment. Currently, there is not yet any explicit connection between the MOI program and EVN's DSM program: the industrial energy savings would be of interest to EVN, since EVN would benefit from peak electric load reductions in the factories being audited by MOI.

Another example of inadequate institutional coordination is the case of coal-bed methane utilization in India. A lack of coordination between Coal India Limited and the Oil and Gas Corporation of India and a conflict over ownership of the methane gas has constrained the utilization of this resource. Recently, however, the creation of a joint venture company between the two agencies with the stated goal of exploiting these resources promises to address this barrier.

Within the region, the Korea Energy Management Corporation (KEMCO) stands out as one of the most successful national energy efficiency agencies. KEMCO was established in 1980 and is the key implementation agency in the area of energy efficiency, new and renewable energy, dissemination of information and public awareness, and climate change mitigation. KEMCO is under the jurisdiction of the

3. For example, the Electric Generating Authority of Thailand (EGAT) and the Department of Alternative Energy Development and Efficiency (DEDE) both had programs focused on energy efficiency in large buildings yet lacked a common customer database for sharing of information.
4. A MEPS for split-system air conditioners took effect in 2005, and a MEPS for refrigerators was scheduled to take effect by the end of 2006. In October 2006, the new Minister of Energy announced that one of his energy policy priorities would be to establish MEPS for several types of energy-using appliances and equipment.

Ministry of Commerce, Industry, and Energy (MOCIE). KEMCO's budget comes from the government's central budget and is quite sizeable: approximately US$1.1 billion for a sustainable energy loan fund, an R&D fund, and work on energy standards and labeling. The Korea Electric Power Company (KEPCO) has a role in energy management, but its role is very focused on issues related to customer peak demand, such as time-of-use rate and peak load management programs. Because of its clear mandate and focus as the single lead agency in energy efficiency implementation, KEMCO has been able to implement a systematic process of establishing and regularly updating its energy standards and labels for appliances and equipment, and even automobiles. The standards and labeling program resulted in reductions in average energy consumption for key equipment on the order of 40 to 50 percent within just a seven-year period (Lee, 2001). While other countries may not be able to deliver such a large amount of annual funding for energy efficiency, the Korean model still offers lessons because it provides for a single lead agency to implement and coordinate all aspects of national energy efficiency programs.

Inadequate resources and institutional capacity are also persistent problems with clean energy institutions. For example, the Bureau of Energy Efficiency in India is charged with implementing energy efficiency programs mandated by the national energy conservation law. The total outlay for the BEE is about US$300,000 in a five-year period (Banerjee, 2005). This relatively small budget constrains the effectiveness of the agency to address an immediate investment potential in the Indian electricity sector that the ADB estimates is approximately US$3 billion. Similar potentials are likely in the oil and coal sectors. If one were to assume that an expenditure of 1 to 5 percent of value of the efficiency potential is required to facilitate realizing this potential, the total budget for the BEE would be closer to US$30 to150 million (Banerjee, 2005).

Recognizing the importance of institutional design, the World Bank recently prepared a major report reviewing the structure and effectiveness of energy efficiency institutions globally. The report analyzed six different models and made a number of recommendations that could be of use to Asian policymakers in the design or reform of their domestic institutions implementing energy efficiency policies and programs (World Bank, 2006).[5]

In short, hundreds of millions of dollars have been spent on the transfer of technologies and implementation of clean energy programs in the developing world, but insufficient emphasis has been placed on the authority, resources, and structure of the implementing agencies and institutions. The result is that government officials and policymakers face significant overlap and opportunity costs as they attempt to revitalize and scale up their clean energy efforts.

PRIMARY BARRIERS IDENTIFIED

The team's research and consultation missions to the focus countries identified the following primary barriers to institutional design and capacity:

- absence of clear authority or scope for implementing agency;
- lack of budget authority to implement programs under nominal legal mandate;
- in the area of energy efficiency, split authority (and overlapping mandates) between DSM programs at utilities and government energy efficiency programs;
- poor coordination between government agencies implementing clean energy initiatives; and
- limited awareness of different institutional models.

5. The report provided case studies for each of the models, and presented the pros and cons of each implementation approach. The report was discussed at a workshop in Korea in late 2006, and the analysis could be used as the basis for a major regional effort to improve the effectiveness of energy efficiency institutions in developing Asian economies.

4.4 MARKET DEVELOPMENT AND TECHNOLOGY TRANSFER

Technology diffusion is essential to meet Asia's development priorities in the energy sector. Recently, the IEA estimated the potential of various technologies for reducing global carbon emissions from the energy sector and concluded that the greatest GHG reductions in the future will come from improvements in end-use efficiency, power generation, and carbon capture and storage (IEA, 2006). The key challenge is to facilitate the transfer and deployment of a broad array of clean technologies from developed countries to developing Asia while fostering the development and improvement of indigenous technology and know-how. Outside of private sector transfer, other vehicles that promote technology transfer include bilateral assistance programs, GEF projects, and activities of multilateral development banks.

The Technology Cooperation Agreement Pilot Project (TCAPP) was a program initiated by the US in 1997 to serve as a model for a country-driven approach to technology cooperation in a number of countries, including Brazil, Mexico, and the Philippines. In the Philippines, TCAPP identified technologies with a potential for rapid implementation and then proposed reforms to existing regulations that inhibited the deployment of such technologies. For example, it helped reform the Mini-Hydro Law, reducing cumbersome permit and accreditation requirements for mini-hydro power development (CTI, 2001).

The Asia-Pacific Partnership on Clean Development and Climate (APP)[6] stands at the forefront among US efforts to address climate change through involving major Asian developing countries. Following the Program Implementing Committee (PIC) meeting in Korea in 2006, all the task forces have submitted proposed projects, most of which include technology transfer activities. Under the Methane to Markets Partnership, the US is also working with India and China to recover and use methane as a clean energy source from oil and gas operations, coal mines, landfills, and livestock operations. In addition to involvement in the APP and Methane to Markets, the US supports several ongoing programs to facilitate technology transfer. For instance, the US Climate Technology Cooperation Gateway (www.usctcgateway.net), supported by USAID and the US Environmental Protection Agency, provides information on a range of US Government supported programs that facilitate international climate technology cooperation. USAID founded the Global Trade and Technology Network (www.usgtn.net) to provide hands-on assistance to companies seeking to export. The network has been re-positioned as a gateway to the US Department of Commerce's US Commercial Service. The US also participates in the Climate Technology Initiative (CTI), a multilateral initiative under the International Energy Agency (IEA) that brings countries together to foster international cooperation in the accelerated development and diffusion of climate-friendly and environmentally sound technologies and practices.[7]

Despite widespread initiatives on technology transfer, many of the barriers to effective technology transfer are cross-cutting and reflect a lack of institutional, policy, and financial frameworks in many countries in the region.

Examples of barriers to technology transfer, diffusion, and adoption are abundant in the literature. The following is a short list summarizing the key challenges that are present at both the regional and country levels, compiled from the United Nations Framework Convention on Climate Change (UNFCCC,1998) and the Institute for Global Environmental Strategies (Srinivasan, 2006). Many of these barriers reflect

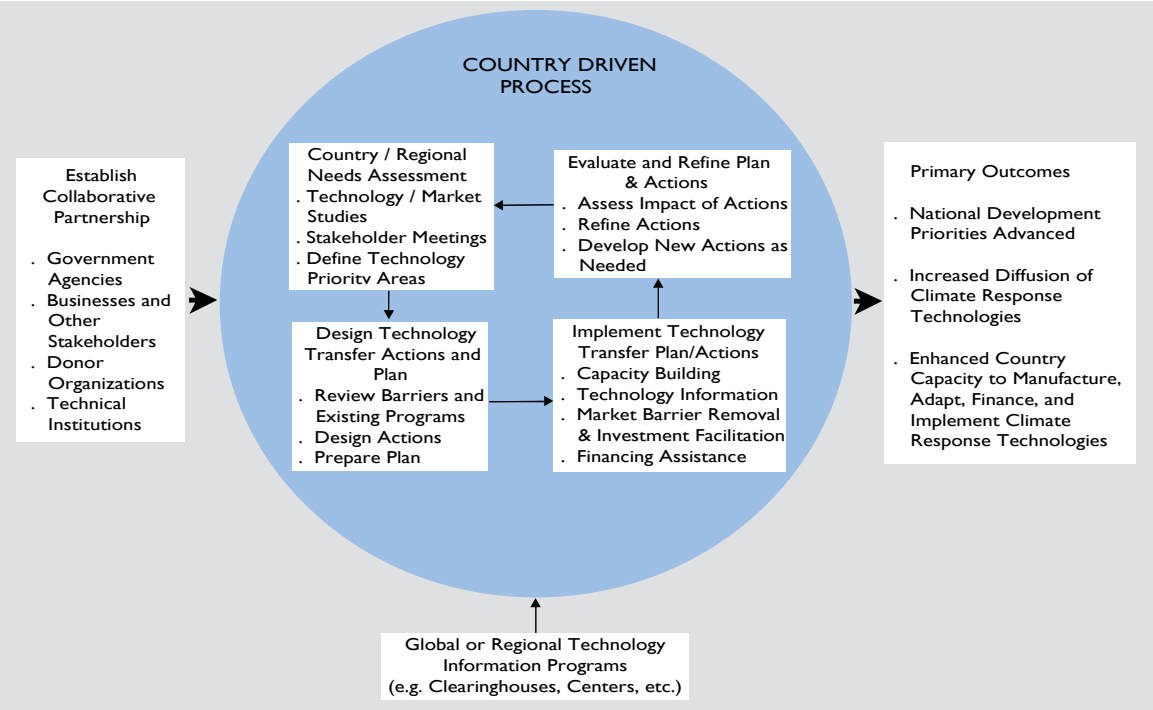
6. See Section 5 and Attachment 5 for details on the APP.
7. For more information about CTI, see www.climatetech.net.

the inadequate or inappropriate enabling environments in the Asia region, which create impediments to the broad involvement of the private sector in the business of technology transfer:

- **Institutional:** lack of legal and regulatory frameworks, including adequate protection for intellectual property rights, limited institutional capacity, and excessive bureaucratic procedures.
- **Political:** instability, interventions in domestic markets (for example, subsidies), lack of coordinated policies.
- **Technological:** lack of infrastructure, limited collaborative R&D, lack of technical standards and institutions for supporting those standards, low technical capabilities of manufacturing firms, and lack of a technology knowledge base.
- **Economic:** non-transparent markets, high costs and capital intensity of renewable energy technologies, subsidies and trade barriers that inhibit uptake of clean energy technologies.
- **Information:** lack of technical and financial information and lack of a demonstrated track record for many clean energy technologies.
- **Financial:** lack of access to investment capital and financing instruments.
- **Cultural:** consumer preferences and social biases.
- **Legal:** intellectual property protection, and unclear arbitration procedures.

A major priority is to tackle barriers using frameworks that closely link government, research institutions, and the private sector to create necessary enabling environments that will facilitate the broad and sustained participation of the private sector. Long-term technology transfer strategies need to closely relate to the development stages of each country, addressing institutional, financial, education, and training issues. The UNFCCC has identified several priority interventions that are essential to overcome the barriers described above (UNFCCC, 1998). The schematic in Figure 29 is useful in understanding the complexity of technology transfer and the many players that take part.

FIGURE 29. THE PROCESS OF TECHNOLOGY TRANSFER AND ITS VARIOUS COMPONENTS



Source: CTI, 2001.

There is a strong mandate for regional cooperation among various stakeholders to coordinate technology transfer activities and to maximize the effectiveness of ongoing activities. Of particular relevance is the potential for Asia-to-Asia technology transfer in multiple areas, including renewable energy and transport technologies, in addition to facilitation of technology transfer from developed nations. The extent to which to which regional initiatives can mobilize existing technologies and help in the development of breakthrough technologies for GHG reductions will ultimately determine the prospects for mitigating climate change and air pollution, promoting economic productivity, and addressing energy security challenges.

PRIMARY BARRIERS IDENTIFIED

The team's research and consultation missions to the focus countries identified the following primary barriers to market development and technology transfer:

- inadequate coordination of policies on technology transfer and promotion;
- lack of harmonized technical standards and institutions for supporting those standards;
- absence of effective industry associations that advocate broadly for policies to support scale-up of clean energy technologies and services;
- high capital costs of clean energy technologies, especially for renewable energy;
- lack of technical and financial information and lack of a demonstrated track record for many clean energy technologies;
- lack of protection for intellectual property rights;
- unclear arbitration procedures; and
- consumer skepticism about actual benefits they will receive from clean energy technologies.

4.5 FINANCIAL AND REGULATORY INCENTIVES

Financial incentives are widely used for the selective promotion of clean energy options all over the world, including in several Asian countries. The key purpose of incentives is to reduce the up-front capital costs of renewable energy and energy efficiency investments and to reduce the tax burden per kWh of electricity generated or saved with the aim of stimulating investment. Thus, incentives are either applied in the form of tax incentives—investment and production tax incentives, property tax reductions, value-added tax (VAT), excise and income tax duty exemptions, accelerated depreciation, tax holidays and taxes on conventional fuel (e.g. fossil fuel tax or a carbon tax) – or a variety of payments such as soft-loans, grants, rebates, and fee-bates.[8]

Experience shows that while tax incentives are easier to administer, they are not as effective as other policy initiatives such as renewable energy production quotas (renewable portfolio standards), feed-in tariffs, government-administered auctions for renewable energy, preferred grid access, and R&D grants. Moreover, tax incentives can sometimes result in perverse consequences. Wind energy development in India is a case in point. An accelerated depreciation of 100 percent led to an extremely rapid growth of the industry. However, many of the investors were simply interested in

"The Asian Development Bank is undertaking a unique loan to the Indonesian utility PLN. The loan package will include approximately US$100 million for procurement and installation of 60 million CFLs in rural households with subsidized electric rates. Each CFL will, when installed, save the utility US$15."

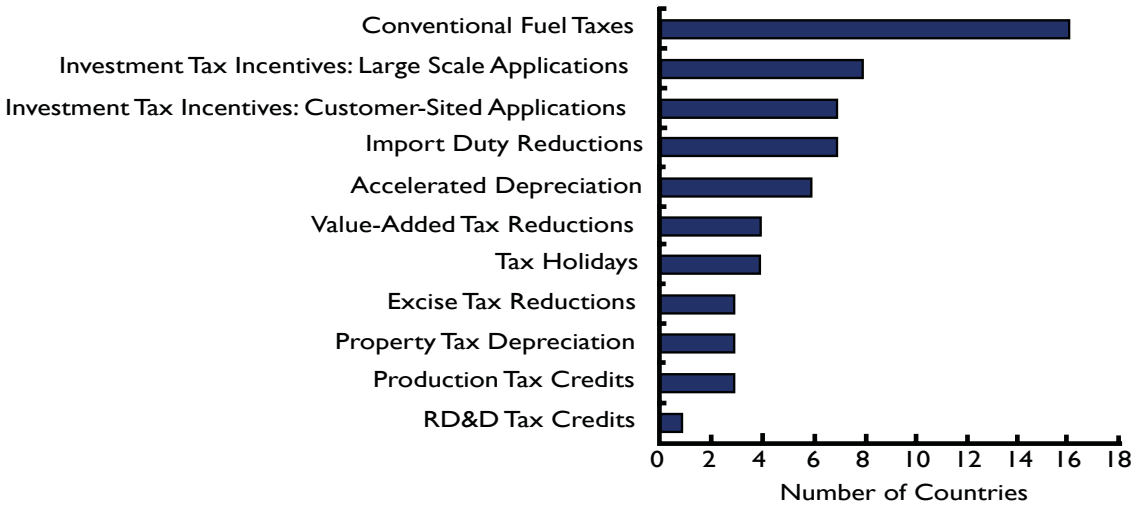
UTILITY MANAGER, INDONESIA

8. See Clement et al., 2005 for a discussion on international experience with tax incentives for promotion of renewable energy and lessons for public policy.

the tax benefits that were applied to capital investments rather the long-term business of producing electricity. The rush to invest led to placement of many wind farms in areas with low wind potential, use of European machinery that is designed for high wind conditions, and inadequate plans for operations and maintenance. As a result, many of the wind farms are operating at less than 20 percent capacity. Linking investment tax credits to performance standards would have gone a long way to ensure that the investments were sound (Martinot, 2002). Thus, it might often be prudent to employ tax incentives in conjunction with other policies, along with awareness-building programs to generate maximum effect.

A review of the prevalence of tax incentives in 29 countries worldwide (Clement et al., 2005) indicates that fuel taxes and investment tax incentives tend to be used most often, while R&D tax credits are used least often (Figure 30). It should be noted that fuel taxes are being applied mostly in developed countries that have signed the Kyoto Protocol. Despite the policy advantages of production tax incentives over investment tax incentives, investment tax incentives remain much more common. In some cases, however, countries convert to production tax incentives from the investment tax incentives that have been favored earlier in the development of the renewable energy industry, at least for larger-scale renewable energy applications. Investment tax incentives for smaller, customer-sited renewable energy applications are currently quite popular and import duty reductions are most common in countries with developing renewable energy industries.

FIGURE 30: FREQUENCY OF USE OF TAX INCENTIVES IN 29 COUNTRIES WORLD-WIDE



Source: Clement et al., 2005.

Below are some general guidelines for the development of effective incentive mechanisms (Clement et al., 2005):

- Countries should aim for tax parity between energy sources and ensure that clean energy options (i.e. energy efficiency or renewable energy equipment) are not taxed higher than conventional sources. In some cases, where it is felt that clean energy is desired, tax systems could favor clean energy.
- A developing industry is best served by generous investment tax incentives and import duty waivers which should then make way for production tax incentives as the industry matures.

- The rate of growth in renewable energy production can be increased if non-taxed public sector organizations can be included (e.g. schools, hospitals, and government agencies).[9]
- Education about the tax incentive programs can aid in the success of promoting renewable energy, especially for tax incentives targeted to households and small businesses.[10] Government agencies offering tax incentives for investments in clean energy technologies need to widely publicize them in order to ensure the tax incentive programs are successful.[11]
- Credibility and enforceability are important in shaping investor and consumer expectations. Programs should be of reasonable duration, uniformly applied, and easily accessible.
- Investment-based incentives should generally include performance standards in order to ensure that equipment has the quality, support, and capabilities necessary for long-term operation.[12] Over time, at least for large clean energy systems, countries should consider moving to production-based tax incentive policies.
- Incentives should apply across technology categories, be consistently applied, and be available over long durations to sustain the interest of financial institutions and investors.[13]

During the country consultations for this report, it became clear that there were major barriers related to the understanding among policymakers of design and implementation of fiscal and financial incentives for clean energy. With regard to the design of incentives, stakeholders in all the focus countries indicated difficulty in easily accessing information about the range of available incentives, as well as the pros and cons of each. There is clearly a need for basic training among regional policymakers on the design of incentives, with case studies from application of different types of incentives, particularly within the Asian region where possible.

Some policymakers have expressed frustration at the lack of government budget to design incentive programs. In this regard, Thailand is seen as having the luxury of its US$40 million annual Energy Conservation Promotion Fund, which is based on a levy on petroleum products. Other countries face a much more difficult process to get high-level policymaker commitment to include funds for clean energy incentives in the government budget. There is little awareness of the high returns from incentive programs, or how to design programs to stimulate energy efficiency investments.[14] A persistent barrier to energy efficiency investments in Indonesia is the subsidized price of electricity. The persistence of low prices nullifies consumer interest in energy efficiency. The Indonesian electric utility PLN is working with the ADB to turn this subsidy into an advantage by investing in a massive, nationwide program to distribute free CFLs to its subsidized rural customers. But in general, government agencies in Indonesia

9. A design component of a tax incentive that would permit public sector organizations to participate would enable such organizations to assign tax credits to businesses in return for a cash direct payment (or a reduction in the cost of the equipment they are procuring).
10. A study of deployment of renewable energy technologies in Egypt, Ghana, and Zimbabwe found that lack of information and awareness of renewable technologies was one of the two biggest barriers to implementation. However, the need for greater information on renewable technologies and incentives is not unique to developing countries. In the United States, experience has shown that people who were interested in installing renewable energy systems and equipment in their homes and businesses often did not know about the availability of tax incentives (Sawin, 2004; Painuly and Fennhan, 2002).
11. For example, international project developers, wind turbine manufacturers, and investors should be made aware of tax incentives for grid-connected wind projects.
12. This may include compliance with safety and operating standards, manufacturer warranties, and industry certifications and testing. Some tax incentive programs require detailed technical information, projected energy production, and certification that the equipment installation was done correctly.
13. Stability in government policy is very important to investors. The frequent expiration of the US renewable energy production tax credit and the uncertainty surrounding its renewal have caused boom and bust cycles in the US wind industry. The success of Germany and Japan in developing strong renewable energy industries in less than a decade can be attributed to long-term government commitments to supportive policies.
14. For example, in Thailand's 30 Percent Subsidy Program, every Thai baht of subsidy leveraged 3.2 baht in private sector investment and resulted in more than 16 baht of energy cost savings over the lifetime of the equipment (Vongsoasup and du Pont, 2004).

have neither the budget nor financial approval for aggressive use of fiscal and financial incentives to stimulate investments in energy efficiency.

PRIMARY BARRIERS IDENTIFIED

The team's research and consultation missions to the focus countries identified the following primary barriers to financial and regulatory incentives:

- inadequate government funding for clean energy incentive programs;
- limited information about track record and comparisons of effectiveness of different incentive and tax mechanisms for clean energy; and
- low rate of uptake of existing tax incentive or duty reduction schemes.

4.6 ACCESS TO FINANCING

Clean energy financing has clearly come of age. Between government funds, venture capital, commercial financing, and multilateral funds, several billion dollars in financing is available annually.[15] The ADB has announced plans to increase its lending for energy efficiency projects to US$1 billion annually, while also launching a variety of instruments including investment funds, loan guarantees, soft loans, and technical assistance (TA) programs. Particularly noteworthy among the proposed investment vehicles is the Asia-Pacific Carbon Fund (part of the Carbon Markets Initiative), which proposes to make upfront purchases of an estimated 25 to 50 percent of future certified emissions reductions (CERs) expected from eligible RE and EE projects (see Section 5). Most large and medium-sized commercial banks in Asia, particularly in India, Thailand, and Indonesia, are attempting to better integrate clean energy projects into their overall lending portfolio. Regionally, APEC has been active in promoting access to finance and under its Energy Working Group has developed a Task Force on Energy Efficiency and Renewable Energy Finance. Two current APEC projects are focusing on reducing the barriers to finance for energy efficiency and renewable energy.[16]

"Thailand's 30 Percent Subsidy Program successfully overcame financial barriers by providing a partial grant for pre-approved energy-saving technologies. More than 350 small and medium projects were implemented and evaluated in just two years."

GOVERNMENT OFFICIAL, THAILAND

Public funding of clean energy activities in developing countries has also been growing. One of the best examples is the Indian Renewable Energy Development Agency (IREDA), which has provided almost US$1.5 billion in financing for 2.5 GW of renewable energy since its inception in 1987. In the Philippines, government banks and financial institutions often serve as the conduit for development financing of clean energy projects, but there is little commercial lending for energy efficiency. The most active banks in this area are the development banks – the Development Bank of the Philippines and the Land Bank of the Philippines, which provide financing to local government units with an emphasis on environmental protection, climate change, and new and renewable energy projects.

Thailand's Energy Efficiency Revolving Fund provides a good example of how to successfully use government funds to catalyze the interest of banks in commercial lending for energy efficiency. In 2000,

15. In India, Suzlon Energy's public issue of shares in 2005 was oversubscribed 51 times, catapulting its promoter, Tulsi Tanti, to the position of being the fourth richest Indian national. Currently, Suzlon is the largest wind energy manufacturer in Asia, and the fourth largest in the world.
16. One project is establishing pilot projects in Mexico and Thailand to test out the concept of a "financing protocol" to facilitate the mainstreaming of financing of energy efficiency projects by commercial banks. Another project is carrying out a survey and establishing a regional system for information sharing on the financing of public sector energy efficiency and renewable energy projects.

an initial survey was done on the potential for investment in energy efficiency technologies and projects in Thailand. While the short-term potential was seen as quite significant, there was little interest among the banks, and only one bank was active in energy efficiency lending. In 2002, the government accessed its ENCON Fund to initiate a US$50 million loan fund for energy-saving projects.[17] The Thai government is now planning to launch its third, US$50 million installment of the fund, which leverages approximately US$5 for every US$1 of government funds. On the other hand, in China, the share of investment in energy efficiency in total energy-sector capital construction fell from 13 percent in the early 1980s to about 3 percent in 2005. In order for China to achieve its government-set energy efficiency targets, it is estimated that 40 percent of capital construction funding in the energy sector (RMB 7 trillion out of RMB 18 trillion) would need to be directed towards energy efficiency investments during the period 2005 to 2020.

The findings from the country consultations suggest that while the overall availability of financing has greatly increased and will further increase in the future, it is still far below the projected requirements for the period ending 2030, and the financing is not uniformly available across sectors, end-users, or technologies. The overall findings of the regional review and country consultations include the following:

- The amount of private-sector financing for clean energy is rapidly increasing, but the financing is not often matched to the needs of the project developers and end-users who need it for their clean energy projects.
- Financing for government-led energy efficiency programs is a problem in most of the focus countries, due to the lack of policymaker awareness of the importance of these efforts and bureaucratic barriers in the government budgeting processes.
- The ADB will play a leading role in efficiency investments in the region, primarily through its Energy Efficiency Initiative, which is targeting $1 billion in annual lending for energy efficiency projects.
- Much work is needed to reach out to commercial banks and financial institutions, to increase their awareness of the importance and benefits of energy-savings, and to increase their knowledge and confidence in lending for energy efficiency investments and also partnering with energy services companies (ESCOs) that develop and provide performance guarantees for energy-savings projects.
- The Project Financing Advisory Network (PFAN) is a pilot initiative of the Climate Technology Initiative (CTI) in cooperation with the UNFCCC Expert Group on Technology Transfer (EGTT) to broaden the access to financing for climate friendly and technology transfer projects. PFAN provides coaching and technical assistance to project developers and other project proponents in developing countries and countries with economies in transition to assist them in the preparation of project financing proposals meeting the standards of the international financing community. PFAN activities commenced in early 2006 and are currently being conducted as a pilot program projected to run into mid-to-late 2007 (CTI, 2007).
- Thailand's Energy Efficiency Revolving Fund is an important example of how to stimulate commercial interest in financing energy efficiency. There is a need to increase awareness of this as a best practice, and also to explore options in the region for similar funds, as well as funds that include credit guarantees.

17. The banks can lend the funds to their customers at an interest rate of up to 4 percent (well below the market rate) in order to fund energy efficiency projects. Government intervention in the financing process is minimized. A useful case study of the fund can be found at http://www.apecenergy.org.au.

PRIMARY BARRIERS IDENTIFIED

The team's research and consultation missions to the focus countries identified the following primary barriers to accessing financing:

- lack of investment capital and financing instruments;
- cumbersome and lengthy processes (18-24 months) to prepare loan agreements or grants with multilateral banks or financial institutions;
- absence of staffing and technical resources in banks to promote or analyze clean energy projects;
- high transaction costs for energy efficiency projects relative to project financing needs;
- lack of qualified projects and proposals submitted to clean energy funding windows; and
- limited experience among project sponsors in preparing and packaging loan and funding requests.

4.7 CARBON MARKETS AND GREENHOUSE GAS REPORTING

With the ongoing interest in clean energy development and carbon markets in Asia, the monitoring and reporting of GHG emissions is assuming increasing priority. Initially, GHG reporting in Asia was undertaken in support of the participation of these countries in the UNFCCC process for developing national inventories. However, of late it is the rapidly growing carbon market that is fueling this interest. Under the UNFCCC process, government agencies focused on energy and environment and energy statistical institutes were trained in GHG accounting practices. This capacity was instrumental in the development of the national communication plans that countries are required to submit under the UNFCCC process.

The international carbon market activity in developing Asia includes offsets for bilateral carbon trading, as well as certified emissions reductions (CERs) issued under the Clean Development Mechanism (CDM) under the Kyoto Protocol. The global market for voluntary carbon offsets has grown rapidly since 2001, and is expected to continue to expand. In 2004, the sixteen leading providers offset more than 9 million metric tons of CO_2-equivalent.[18,19] Overall, participation in the voluntary carbon offsets market has been relatively small in Asia, but is expected to continue to grow as an alternative market to CDM projects (Taiyab, 2006). The offsets market uses a variety of standards, protocols and verification methods, including: the Gold Standard (set up by a consortium of NGOs); the Climate, Community, and Biodiversity (CCB) Standards (set up by a consortium of NGOs and the private sector); the CDM/Joint Implementation Standard; and self-developed standards and labeling schemes developed by some offsets providers. Developing Asia has a large share of the total CDM projects worldwide, and currently India and China account for nearly 87 percent of the expected CERs in Asia.[20] The CDM mandates use of its approved methodologies for project-level GHG accounting.

Current technical assistance aimed at promoting GHG accounting and reporting includes activities of the ADB and World Resources Institute (WRI), and planned activities implemented by the APP. ADB activities are aimed at supporting the CDM. WRI is working in four Asian countries (India, China, South Korea, and the Philippines) to promote the Greenhouse Gas Protocol,[21] a widely used accounting framework for business and government to understand, quantify, and manage GHG emissions. WRI is

18. This term "CO_2-equivalent" normalizes emissions of non-CO_2 GHGs so that they are expressed in terms of their global-warming potential relative to that of a unit of CO_2.
19. However, these figures do not specify the actual quantity of offsets sold and include only 60 per cent of the known providers.
20. Cited in CD4CDM (2006) from a December 2006 assessment.
21. See www.ghgprotocol.org for more details.

engaged in a dialogue in India, and with USEPA and USAID support, has already collaborated with the Indian power and cement sectors to customize GHG accounting tools to incorporate local sustainable development indicators. With support from other sources, WRI has trained South Korean companies and policymakers on GHG accounting and GHG program design, and has recently reached an agreement with an industry association in China to initiate the development and implementation of a capacity-building program on energy and GHG management. At this time, APP is exploring options to establish a framework for training stakeholders in participating countries to monitor and report GHG reductions that would result from APP projects, or a mechanism for sharing this information (e.g. an Internet portal).

STATUS OF GHG REPORTING IN THE FOCUS COUNTRIES

The development of climate change projects in China for international carbon financing programs has strengthened the capacity of Chinese project developers to measure and report GHG emissions. However, the measuring and reporting of GHGs is not yet common practice, and the government of China has yet to mandate systematic GHG reporting on a local or national level. As a consequence, at this time GHG emissions data, including those cited in this report, are estimates only. Several measures were identified by stakeholders in China that would greatly improve GHG reporting (see country report, Annex 1). These include: conducting a policy study on cost-benefit analysis of reporting GHG emissions; establishing both national and local measuring and reporting systems; establishing GHG emission control planning and strategies; and advocating these plans and strategies publicly. Similarly, in India, except for the number of climate change projects submitted through the CDM process, there are no established policies or guidelines supporting GHG accounting, and there are no locally developed protocols.

With USAID support, and in collaboration with WRI, the Philippines has implemented the Philippines Greenhouse Gas Accounting and Reporting Program (PhilGARP), a voluntary program for GHG accounting designed to train businesses and organizations on GHG management. PhilGARP is based on WRI's GHG Protocol standards and tools, which provide guidance for corporate inventories. It is anticipated that PhilGARP will serve as a platform for public reporting and information dissemination on GHG management issues. In Vietnam, GHG measurement and reporting is undertaken by the Energy Efficiency Centers located in the cities of Hanoi, Hai Phong, Danang, and Ho Chi Minh, as well as in Dong Nai Province. These centers are under the jurisdiction of the Standards and Measurement Center of Vietnam (STAMEC), which in turn is under the Ministry of Science and Technology.

In general, much of the GHG reporting in these Asian countries is project-based and has been tailored to the accounting and reporting requirements of a single international carbon financing mechanism, the CDM. The expansion of international carbon markets and financing may serve to greatly increase GHG accounting and reporting capabilities while also furthering the goals of clean technology investment. More broadly, there is a need in Asia for training and capacity building on GHG reporting at the corporate, sector, and national levels, so that stakeholders can "take stock," develop baselines and monitor the impacts of their GHG mitigation activities. Such measurements would serve voluntary disclosure programs and compliance needs within the countries, or generate credits for non-Kyoto carbon markets such as the growing offsets market and the emerging markets in West Coast and Northeastern states in the US, as well as private markets such as the Chicago Climate Exchange.

PRIMARY BARRIERS IDENTIFIED

The research team's consultation missions to the focus countries identified the following primary barriers to carbon markets and greenhouse gas reporting:

- lack of established national policies, programs, practices and requirements for national GHG monitoring and reporting; and
- focus on project-based accounting tailored to the monitoring and reporting requirements of the CDM, and resulting lack of greenhouse gas reporting at the corporate, sector, and national levels to develop baselines and monitor overarching impacts of GHG mitigation activities.

4.8 CAPACITY BUILDING AND INFORMATION TRANSFER

The regional review of clean energy program implementation capabilities across the region suggests that the current abilities and needs vary widely across countries and across sectors within individual countries. While there are plenty of ongoing and planned capacity-building activities in clean energy throughout the region, stakeholders frequently reported a sense of "fatigue" with conventional capacity-building activities. Stakeholders emphasized the need for targeted training that adopted a problem-solving approach. Such an approach would lay out an iterative process of context setting, identification of solutions, implementation, and reporting, leading to corrective action. An oft-mentioned problem is that there is typically no follow-up to the training courses and workshops, a fact which virtually ensures that the "learning" is not effectively applied in the participant's work.

"In the training workshops, whether they are national or regional, all the information gets homogenized and diluted. When an issue is taken out of context and presented in a general way in a workshop, it loses its usefulness."

PHILIPPINE STAKEHOLDER

In general, India and China, owing to the presence of indigenous, well-diversified clean energy sectors, have high levels of local capacity in a variety of areas. In terms of technologies, stakeholders expressed a need for training in advanced fossil fuel technologies (e.g. coal, LNG) and in biofuels production and distribution. In terms of market transformation approaches, government agencies favor capacity building in the areas related to the design and implementation of clean energy policies and incentives. Stakeholders were also interested in learning about and adapting successful financing approaches that have been tried in the region (e.g. IREDA, Thailand's Energy Efficiency Revolving Fund). Improved regulatory performance is also an area that was highlighted in discussions, especially related to large, point source emitters, and the transport sector.

The ease of availability to up-to-date information on clean energy is another issue that came up repeatedly during discussions. While there are a few websites and portals[22] that provide information on aspects related to clean energy, stakeholders emphasized the need for a comprehensive knowledge management portal that would support not just a clearinghouse of information on technologies, best practices, and case studies, but also e-seminars, e-learning, discussion groups, and other online collaboration tools.[23] Given the relatively high internet penetration in Asia, online communities of practice offer a significant opportunity for low-cost, real-time collaboration.[24]

22. See, for example, AP-NET (www.ap-net.org), Clean Air Initiative-Asia (www.cleanairnet.org), and the APEC Energy Standards and Information System (www.apec-esis.org).
23. The ADB, in 2006, announced that it would support a clean energy knowledge hub at The Energy and Resources Institute, Delhi and another on climate change at Tsinghua University, Beijing. These hubs will function as centers of excellence on emerging topics in clean energy and climate change, respectively, to promote knowledge sharing, dissemination, and build regional capacity.
24. The Buildings and Appliance Task Force of the APP has developed a potential flagship project entitled "Harmonization of Testing Procedures Utilizing Communities of Practice Model" (APP-BATF, 2006). Other examples are: APEC Energy Standards Information System (www.apec-esis.org), the IEA's Energy Efficiency Policy and Measures Database (www.iea.org/textbase/eff), and the REEGLE Information Gateway of the Renewable Energy and Energy Efficiency Partnership (www.reegle.info).

PRIMARY BARRIERS IDENTIFIED

The research team's consultation missions to the focus countries identified the following primary barriers to capacity building and information transfer:

- limited training for policymakers on design, implementation, and evaluation of clean energy policies and regulation;
- no real-time existing regional information network for policymakers to stay up to date on status and effectiveness of different clean energy policies and approaches;
- limited experience in the enforcement and compliance of clean energy programs;
- lack of experience developing public-private partnerships in the area of clean energy and converting the considerable interest among the private sector into real, tangible investments; and
- lack of private sector input into the design and oversight of clean energy policies and programs.

4.9 CONCLUSIONS

The survey of barriers and opportunities suggests that the clean energy development landscape in Asia is both vibrant and varied. Asian leaders are increasingly aware of the need for energy conservation and clean energy promotion and have announced a plethora of policies and regulations. However, much can still be done in terms of translating the laws and policies into tangible outcomes. Table 13 summarizes the primary barriers encountered during our regional review, and proposes a set of remedies for regional action.

TABLE 13. KEY BARRIERS AND REMEDIES FOR REGIONAL ACTION TO SCALE-UP INVESTMENT AND DEPLOYMENT IN CLEAN ENERGY TECHNOLOGIES

Type of Barrier	Specific Barriers	Remedies to Remove Barriers
Policy and regulatory frameworks	• Undeveloped legal and regulatory frameworks and limited institutional capacity to implement laws and regulations • Limited knowledge of the status and progress of clean energy policies and programs in other countries in the region • Lack of training in detailed design of implementing rules and regulations for clean energy programs	• Design and implement regional training on clean energy policies and regulations, with emphasis on Asian best practices • Establish information clearinghouse on regional clean energy policies and regulatory frameworks • Design and implement hands-on regional training in the drafting of implementing rules and regulations to support broader clean energy legislation
Institutional design and capacity	• Absence of clear legal authority and adequate budget allocation for implementing agencies • Poor coordination between government agencies implementing clean energy initiatives • Limited of awareness of different institutional models	• Clarify mandate for clean energy institutions and adequate budgetary and human resources • Facilitate inter-agency coordination and public-private partnerships that can foster greater cooperation • Design and implement practical training courses on best practices for clean energy scale-up
Market development and technology transfer	• Inadequate coordination of policies on technology transfer and promotion • Lack of harmonized technical standards and institutions for supporting those standards • Absence of effective industry associations that advocate for clean energy • Consumer skepticism about actual benefits they will receive from clean energy technologies	• Design and implement policies and programs that support technology R&D and import for market application • Establish regional working groups to develop common standards and protocols for clean energy technologies • Provide government leadership and support for public-private sector working groups to help formulate policy • Promote case studies documenting consumer benefits

TABLE 13. KEY BARRIERS AND REMEDIES FOR REGIONAL ACTION TO SCALE-UP INVESTMENT AND DEPLOYMENT IN CLEAN ENERGY TECHNOLOGIES

Type of Barrier	Specific Barriers	Remedies to Remove Barriers
Financial and regulatory incentives	• Inadequate government funding for clean energy incentive programs • Limited information comparing effectiveness of different incentive and tax mechanisms • Low rate of uptake of existing tax incentive or duty reduction schemes	• Establish public benefits funds (PBFs) funded through electricity tariffs • Establish clearinghouse on fiscal and financial incentives for clean energy across Asia • Design and implement education and promotion campaigns targeted at households and small businesses
Access to financing	• Cumbersome process for loan agreements or grants with multilateral banks or financial institutions • Project sponsors lack experience at preparing and packaging loan/funding requests • Inadequate staffing and technical resources in banks to promote or analyze clean energy projects	• Simplify and streamline project development process • Establish project development facility with technical assistance • Design and implement training for banks, and develop "financing protocol" to facilitate evaluation of clean energy loans
Carbon markets and GHG reporting	• Focus on project-based GHG reporting tied to a single international carbon financing mechanism, the CDM • Lack of knowledge and capacity for GHG measurement and accounting as a management tool for corporations	• Develop a common regional and international GHG reporting system that can be used and accepted in all carbon markets • Develop corporate interest in training courses for GHG measurement and accounting as a risk management tool
Capacity building and information transfer	• No regular existing regional information network for policymakers to stay up to date on effectiveness of clean energy technology policies • Absence of curriculum on design, implementation, and evaluation of clean energy policies and regulation • Limited experience in the enforcement and compliance of clean energy programs • Lack of private sector input in the design and oversight of clean energy policies and programs	• Establish regional, "virtual" Center of Excellence on clean energy technologies and their performance and application • Design and implement regional training courses on specific aspects of actual design and implementation of clean energy policy and regulation • Training government officials in mechanisms for program enforcement and compliance • Develop a regional association of private sector organizations dedicated to clean energy

Government agencies in the region need training and technical assistance to design and implement measures, coordinate activities across agencies and jurisdictions, and improve enforcement. Asia has served as an "incubator" for a range of market transformation approaches and models, including public benefit funds, soft loans, project development facilities, and investment funds, and some Asian countries are at the forefront of the global carbon market. However, in order to realize the requisite clean energy investment, a significant "push" is needed to facilitate access to financing by streamlining lending to clean energy projects, addressing non-market barriers, and fostering a favorable investment climate.

Cost-effective access to advanced technology will be critical to any clean energy development strategy. Much of Asia's energy infrastructure is old, and it is imperative that the rush to put in place new infrastructure at a low cost does not result in "more of the same." Access to clean coal, natural gas, carbon sequestration, and efficient transportation-related technologies need to figure prominently in Asia's clean development plans. Capacity-building plans need to closely match the needs of developing Asia, with a focus on problem solving and improved coordination, both within and among public sector and public-private entities.