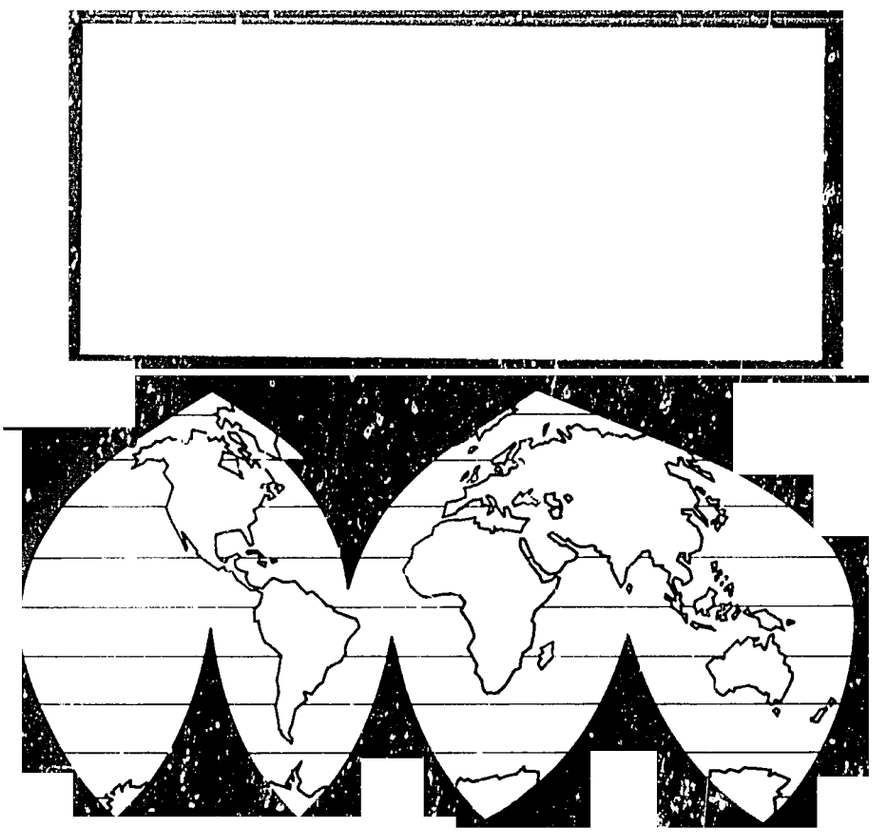
A Report of the

Energy Conservation Services Program



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ACCELERATING PRIVATE INVESTMENT IN ENERGY CONSERVATION

Identification and Analysis of Key Barriers and Policy Tools

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Prepared for:
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EXECUTIVE SUMMARY

BACKGROUND

Energy conservation is a cheap, quick, and relatively painless way for most AID-assisted countries to slash energy costs, stretch energy supplies, and save foreign exchange. Many energy conservation projects are still cost-effective investments, despite low world oil prices. Regardless of what happens to world oil prices, energy conservation improves the engineering and management capabilities and increases the profitability and competitiveness of energy-consuming enterprises, promotes economic efficiency throughout the economy, and has proven to be an effective vehicle for private-sector development. However, the private sector in AID-assisted countries has captured only a fraction of the energy conservation potential. This "inertia" is the result of numerous technical, economic, financial, and institutional barriers.

Four factors -- the important role that the private sector plays in USAID's development strategy, the growing trend toward privatization in AID-assisted countries, the potential for using energy conservation as a vehicle to promote private enterprise development, and the private sector's proven responsiveness to proper market signals and incentives -- dictate that the barriers to private investment in energy conservation be identified. Once this is done, USAID can help individual countries develop strategies and select policies to overcome these barriers and create an attractive climate for private investment. USAID will also be better equipped to design and implement successful private-sector conservation projects and programs. As a first step in this process, Hagler, Bailly & Company, the prime contractor for the Office of Energy's Energy Conservation Services Program (ECSP), has carried out a study of the barriers to private investment in energy conservation and the policy tools that governments can use to overcome them.

OBJECTIVES AND METHODOLOGY OF THE STUDY

The objectives of the study were:

- To systematically identify and gain a better general understanding of the principal barriers to private investment in energy conservation in AID-assisted countries
- To increase awareness and stimulate discussion of the barriers and the steps needed to overcome them

- To provide missions and host governments with a useful framework and "checklist" for identifying the barriers before they jeopardize the implementation and performance of energy conservation projects
- To identify issues requiring further research
- To recommend the next steps for USAID in its efforts to overcome the barriers to private investment in energy conservation and promote private-sector development in AID-assisted countries.

To achieve the study objectives, ECSP staff:

- Reviewed the energy conservation and private investment literature and prepared a bibliography on general and sector-specific barriers to private investment in energy conservation
- Discussed the barriers to energy conservation with a number of experts in the energy conservation and private investment fields
- Based upon the literature review and discussions, identified the general and sector-specific barriers
- Organized the barriers according to a classification system
- Compiled "checklists" of general and sector-specific barriers, grouped according to the classification system, and cross-referenced to the bibliography.

STUDY FINDINGS

The preliminary findings of the study are:

1. To date, there has been little formal analysis of the barriers to private investment in energy conservation
2. The barriers can be classified into four broad, although artificial, categories: technical, economic, financial, and institutional
3. Most of the literature does not explicitly differentiate between general and sector-specific barriers to private investment in energy conservation, although some sector-specific barriers are identified
4. In general, the barriers to foreign private investment are not conservation-specific

5. Further research and analysis are necessary to help the Office of Energy and the missions work with host governments to seek ways to address the barriers in individual AID-assisted countries.

THE BARRIERS TO PRIVATE INVESTMENT IN ENERGY CONSERVATION

The literature review and discussions with experts indicate that the barriers to private investment in energy conservation are varied, often interrelated, overlapping and country-specific, and sometimes sector-specific. It is still useful, however, to use a system for organizing the barriers. The classification system used in this study was modeled after and builds on the system developed by the World Bank for addressing barriers to industrial energy conservation.

Technical barriers were defined as informational and physical constraints to private investment in energy conservation. Technical barriers identified in the study include:

- Lack of awareness of energy conservation need and potential
- Lack of energy data
- Lack of skilled manpower
- Lack of energy conservation goods and services

Economic barriers were defined as those factors that affect the economic viability of energy conservation investments. Those identified in the study include:

- Current low world oil prices
- Domestic price distortions
  - energy prices set below their economic opportunity costs
  - distortions in the relative prices of competing energy products
- The small proportion of an energy consumer's total costs accounted for by energy.

Financial barriers were defined as those factors that affect the private sector's willingness and ability to finance economically viable energy conservation investments. These include:

- Lack of internal sources of capital

- Lack of access to financing on attractive terms

Institutional barriers were defined as elements of the structure, management, responsibility and authority of organizations and institutions that inhibit energy efficiency and certain types of laws and regulations. Institutional barriers identified include:

- Lack of government commitment to energy conservation
- Public resistance
- Lack of energy efficiency standards
- Foreign exchange policies and regulations
- Tariffs and import restrictions

Sector-specific barriers to private investment in energy conservation identified in the study include:

- Industry-specific: insufficient data on energy use by enterprise, product and energy source, and on fuel costs, production levels, and plant size; cost-plus pricing policies; hesitation to interrupt production flows to retrofit equipment; and reluctance to share information on production efficiency improvements with competitors
- Agriculture-specific: lack of information on traditional energy consumption; lack of data on the comparative technical and economic performance of various irrigation pumping options; subsidized electricity tariffs and diesel fuel costs; and national and donor agencies have yet to treat agriculture and energy as related issues
- Transportation-specific: Lack of information on energy use by different transport modes, the relationship between energy use and vehicle maintenance, driver behavior, and fuel efficiency, and truck load availability; lack of skilled mechanics and drivers; lack of spare parts, poor fuel quality; low scrapping rates of vehicle fleets; high income elasticities and low price elasticities; energy-efficient vehicles are more expensive than less efficient vehicles; and a lack of coordination of energy, transportation, and urban planning
- Buildings-specific: Lack of data on energy consumption by type of energy, service, and building category; lack of manpower trained in energy-efficient design, construction, installation, and maintenance; lack of insulation materials and heat pumps; large public housing

sectors with little concern for providing low-cost housing; inherent landlord/tenant conflict of interest; fragmented nature of the sector; and lack of building codes.

- Electric-power specific:

  - Coordination of data gathering and bookkeeping are poor.
  - There is often a multitude of regulatory authorities and distribution agencies, and coordination is poor.
  - Electric utilities focus more on building new power plants than on improving the operation of existing plants and promoting electricity use.
  - Utility and industrial managers are unfamiliar with cogeneration and independent power options.
  - There is a lack of power experts in both the government-owned utilities and private sector.
  - Because cogeneration and small-scale power systems are new and unfamiliar, the most suitable demonstration systems and appropriate equipment and spare parts are often unavailable.
  - Low world energy prices favor large utilities, which tend to use coal or oil, over small-scale, private systems, which more often use renewable energy sources.
  - Because public utilities are subsidized, it is difficult for private power systems to compete.
  - The magnitude of power investments makes them much more difficult to finance than other conservation investments.
  - There are no well-developed sources of long-term financing for investments in private power systems.
  - Public utilities have priority access to low-cost capital.
  - There is no institution to coordinate private-sector power generation.
  - There is seldom a specific policy for private investment in the power sector and usually no pricing policy for privately generated power.
  - Independent producers must either sell power to the utilities or use their network, however, there is generally no framework for transactions with the private sector.
  - Restrictive legislation and regulations often discourage private power generation.
  - The private sector often doubts the government's commitment to private-sector power generation.

ENERGY CONSERVATION POLICY TOOLS AND THEIR EFFECTIVENESS

Governments can exercise a broad range of powers and policy instruments -- price and non-price mechanisms -- to remove market and non-market barriers to energy conservation and make energy conservation investments more attractive to the private sector. Perhaps the most important government action is a high-level commitment to and leadership of energy conservation. A government endorsement of energy conservation, together with a political mandate to promote energy conservation, is the starting point for effective energy conservation policies. Other policy instruments -- price and non-price tools -- include:

- Providing economically "correct" price signals
- Offering financing incentives, including:
  - grants/cost-sharing for technology demonstration
  - grants/no-risk loans for audits and preliminary engineering studies
  - subsidized-interest loans
  - revolving credit funds
  - loan guarantees
  - insurance programs for project technical performance
- Reducing or eliminating tariffs and import restrictions on energy-efficient equipment
- Providing tax-related incentives, including:
  - investment tax credits
  - accelerated depreciation of conservation investments
  - tax holidays
- Developing efficiency standards and labeling for energy-consuming equipment
- Enacting mandatory energy efficiency requirements and regulations.

There is no "magic" energy conservation policy strategy. Each country needs to assess its particular needs, priorities, resources, and capabilities to determine the most appropriate local mix of energy conservation policies.

Experience has shown, however, that the most successful national energy conservation policies have been those that are part of a well-balanced, comprehensive energy conservation strategy that includes a public-private partnership and a mix of policies that address general and specific technical, economic, financial, institutional and political barriers. Thus, the policies tools above need to be integrated into a country's overall policy framework and complemented by other measures, such as information dissemination and public awareness campaigns, data gathering, technical assistance and training, sponsorship of research and development, and continuous monitoring and evaluation of energy conservation policies and programs.

ADDITIONAL RESEARCH NEEDS AND NEXT STEPS FOR USAID

Research Needs

One of the main findings of the study is that there has been little formal analysis of the barriers to private investment in energy conservation in LDCs. Hence, research efforts should focus on:

- Quantifying the impact of the barriers on the economies of AID-assisted countries
- Identifying and analyzing country- and sector-specific barriers
- Identifying and analyzing energy conservation-specific barriers to foreign investment
- Identifying countries that have been successful in encouraging private investment in energy conservation (e.g., Korea, Thailand), analyzing their programs, determining their replicability in AID-assisted countries, and preparing country case studies to be distributed to the missions.

Next Steps for AID

Although increasing the role of the private sector is a cornerstone of USAID's development strategy, the human and financial resources available for promoting private-sector initiatives are extremely limited. Hence, the Office of Energy cannot address all the barriers to private investment in energy conservation in all AID-assisted countries. Rather, it needs to focus its efforts on those barriers and those countries where the need, the potential impact, the likelihood of success, and the potential for replicability are the greatest.

To make this determination, USAID must first identify and analyze the barriers in individual AID-assisted countries. To this end, the Office of Energy has designed and distributed a survey to gather current information on country-specific policies or practices that may inhibit or encourage investment in energy conservation. The results of the survey will provide USAID with a comprehensive and timely "database" of country-specific policies and practices that affect investment in energy conservation projects and programs. This database will enable USAID to take its first systematic look at all the potential areas for energy policy reform in AID-assisted countries and will serve as the basis for defining a private-sector strategy for energy conservation. The survey results can then be used to target USAID's energy policy reform and private sector promotion efforts using the methodology and criteria described below.

Identify Key Policy Barriers

The criteria for identifying key policy barriers will be:

1. The severity of the barrier, which will be determined by:
    - The number of AID-assisted countries where the barrier exists
    - The relative impact of the barrier on each country where it exists.
2. The likelihood of successfully removing the barrier, which will be determined by, among other factors:
    - USAID's expertise and leverage
    - The cost of removing the barrier
    - The political sensitivity of removing the barrier.

The result of this analysis will be a numerical ranking of the key barriers to private investment in energy conservation in AID-assisted countries.

Identify Priority Countries

The criteria for identifying priority countries will be:

1. The need to address the barriers, which will be determined by:
    - The country's energy conservation need and potential

- The country's priority for USAID
- The severity of the barriers in the country

2. The likelihood of success, which will be determined by:

   - Whether the country has a generally active private sector
   - Whether the government is sympathetic to enhancing the private sector's role in the economy in general and in energy conservation in particular
   - Whether the government is committed to energy conservation (e.g., does an energy conservation institution and plan exist?).

The result of this analysis will be a numerical ranking of priority countries for Office of Energy efforts to address the key barriers to private investment in energy conservation.

INTRODUCTION

Energy conservation is a cheap, quick, and relatively painless way for most AID-assisted countries to slash energy costs, stretch energy supplies, and save foreign exchange. Despite lower world oil prices, many energy conservation projects are still cost-effective investments. The results of a recent study[1] indicate that opportunities for simple oil conservation investments are not significantly reduced by today's less robust oil price outlook. Even if oil prices do not rise in real terms over the coming decade, simple, low cost investments will continue to offer high returns to investors and generate significant economic benefits and foreign exchange savings. More capital-intensive investments will continue to be cost-effective assuming that oil prices increase at moderate rates in the coming years. Energy conservation also improves the engineering and management capabilities and increases the profitability and competitiveness of energy-consuming enterprises. By producing more output with the same energy input, energy conservation promotes economic efficiency throughout the economy. Finally, energy conservation has proven to be an effective vehicle for private-sector development.

In the last three years, USAID has initiated more than 34 energy conservation projects in nearly 30 less developed countries (LDCs). Most projects have quickly achieved substantial energy savings. In Guatemala, Honduras, El Salvador, Costa Rica, and Panama a regional industrial energy efficiency project is saving industrial facilities $0.5-1 million per year, mostly through the implementation of low-cost measures.[2] In Costa Rica, a transportation energy conservation demonstration project achieved impressive results: energy-efficient driving and improved vehicle maintenance together produced fuel savings of 11 percent in a major San Jose bus company and 17 percent in a large taxi cooperative. In Kenya, an energy conservation program reports annual industrial energy savings of $1.1 million. In Sri-Lanka, a project resulted in fuel consumption savings of 25 percent per tire produced at the Sri Lanka Tyre Corporation. Two private-sector demonstration projects in the Dominican Republic reduced oil consumption by 20 percent in a paper plant and electricity use by 45 percent in an ice plant. A project in Jamaica has

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[1] Steven C. Fischer. "Energy Conservation and Changing Oil Prices." Paper presented at Energy Conservation and Private Power Generation Workshop, September 29 - October 3, 1986. Sponsored by Office of Energy and Bureau for Asia/Near East, USAID, under ECSP.

[2] Hagler, Bailly & Co. Regional Industrial Energy Efficiency Project. Second Evaluation, Final Report. Prepared for Central American Technical and Industrial Research Institute (ICAITI) and U.S. Agency for International Development, Regional Office for Central America and Panama (ROCAP), December 1985.

helped the country reduce its energy intensity (energy consumption per unit of real GDP) by 33 percent between 1973 and 1985. In addition, audits and retrofits in the country's sugar industry reduced energy consumption by 60 percent between 1981 and 1984.

One of the four components of USAID's long-term strategy is to promote private-sector development in AID-assisted countries.[3] To this end, a primary goal of the Office of Energy has been to increase private-sector activity in the energy sector of the host government's economy. Energy conservation programs offer an excellent opportunity for USAID to enhance the private sector's role in AID-assisted countries:

- Energy conservation technologies are well understood and highly developed in the United States (i.e., there is little technical risk)
- The average energy conservation investment is relatively small
- Successes can be replicated in both the host country and other AID-assisted countries.

However, the private sector in AID-assisted countries has captured only a fraction of the energy conservation potential. This "inertia" is the result of numerous technical, economic, financial, and institutional barriers which discourage private investment in energy conservation.

Governments can exercise a broad range of powers and policy instruments -- price and non-price mechanisms -- to remove market and non-market barriers to energy conservation and make energy conservation investments more attractive to the private sector. These policy tools include:

- Providing economically "correct" price signals
- Offering financing and tax incentives
- Reducing or eliminating tariffs and import restrictions on energy-efficient equipment
- Developing efficiency standards and labeling for energy-consuming equipment
- Enacting mandatory energy efficiency requirements and regulations.

[3] The other three components are Policy Dialogue; Institutional Development and Training; and Technology Research, Development, and Transfer. See Blueprint for Development: The Strategic Plan of the Agency for International Development. 1985.

Experience has shown that the private sector responds quickly and positively to projects and programs designed to encourage its participation in energy conservation. For example:

- In late 1983 and early 1984, USAID trained 45 Sri Lankan engineers and energy officials in energy management techniques and energy auditing. Since then, more than ten energy audits have been performed by private consulting firms headed by people who attended the training courses. The Sri Lankans have also formed their own private-sector energy managers' network -- the Sri Lanka Energy Managers' Association -- which has been successful in performing follow-up activities initially sponsored by the government.

- In Thailand, electricity generation per unit of GDP grew at an average rate of 16 percent per year during the 1960s and 6 percent per year during the 1970s, when electricity prices were subsidized. Beginning in 1979, the Thai government substantially increased electricity prices, and between 1980 and 1982, electricity generation per unit of GDP grew by only 1.5 percent per year.[4] In addition, Thailand reduced the import duty on energy-efficient equipment from 30 percent to 10 percent. As of early 1986, more than 100 private industrial enterprises had applied for import duty exemptions.[5]

- The Regional Industrial Energy Efficiency Project (Guatemala, Honduras, El Salvador, Costa Rica, and Panama) has been successful in selling its services to the private sector, and the income from these sales has been growing.

- As a result of an AID-supported industrial energy conservation program in the Dominican Republic, 42 private Dominican engineering firms have registered to conduct energy audits. Sixty-two audits are in various stages of completion and 8 million pesos from a $14.5 million credit line have been or are being committed to energy conservation projects.

Four factors -- the important role that the private sector plays in USAID's development strategy, the growing trend toward privatization in AID-assisted countries, the potential for using energy conservation as a vehicle to promote

[4] See Gary Gaskin. Thailand: Industrial Energy Conservation and Efficiency. Energy Department. The World Bank, July 1985 and A. Kadir and Y.H. Kim, "Electric Power in ASEAN Countries: A Brief Description," WP-84-15, Resource Systems Institute, East-West Center, Honolulu, 1984.

[5] Personal communication with Vinod Shrivastava, EER Technologies Corporation, May 1986.

private enterprise development, and the private sector's proven responsiveness to proper market signals and incentives -- dictate that the barriers to private investment in energy conservation be identified. Once this is done, USAID can help individual countries develop strategies and select policies to overcome these barriers and create an attractive climate for private investment. USAID will also be better equipped to design and implement successful private-sector conservation projects and programs. As a first step in this process, Hagler, Bailly & Company, the prime contractor for the Office of Energy's Energy Conservation Services Program (ECSP), has carried out a study of the barriers to private investment in energy conservation and the policy tools that governments can use to overcome them.

OBJECTIVES OF THE STUDY

The objectives of this study were:

- To systematically identify and gain a better general understanding of the principal barriers to local and U.S. private investment in energy conservation in AID-assisted countries
- To increase awareness and stimulate discussion of the barriers and the steps needed to overcome them
- To provide missions and host governments with a useful framework and "checklist" for identifying the barriers to private investment in country- and sector-specific settings before they jeopardize the implementation and performance of energy conservation projects
- To identify issues requiring further research
- To recommend the next steps for USAID in its efforts to overcome the barriers to private investment in energy conservation and promote private-sector development in AID-assisted countries.

METHODOLOGY OF THE STUDY

To achieve the study objectives, Hagler, Bailly staff performed the following tasks:

1. Reviewed the energy conservation and private investment literature and prepared a bibliography on general and sector-specific barriers to private investment in energy conservation (Appendix A)

2. Discussed the barriers to energy conservation with a number of experts in the energy conservation and private investment fields (See Appendix B for a complete list of contacts)

3. Based on the literature review and discussions, identified the general and sector-specific barriers

4. Organized the barriers according to a classification system

5. Compiled "checklists" -- or inventories -- of general and sector-specific barriers, grouped according to the classification system, and cross-referenced to the bibliography (Appendices C-E).

PRELIMINARY FINDINGS OF THE STUDY

The preliminary findings of the study are:

- To date, there has been little formal analysis of the barriers to private investment in energy conservation
- The barriers can be classified into four broad, although artificial, categories: technical, economic, financial, and institutional
- Most of the literature does not explicitly differentiate between general and sector-specific (industry, agriculture, transport, buildings, electric power) barriers to private investment in energy conservation, although some sector-specific barriers are identified
- In general, the barriers to foreign private investment are not energy conservation-specific
- Further research and analysis are necessary to help the Office of Energy and the missions work with host governments to seek ways to address the barriers in individual AID-assisted countries.

The first two findings are summarized below.

Little Analysis of the Barriers

The literature review included database searches on energy conservation (in general and by sector) and private investment in LDCs, and visits to international organization and U.S. government libraries. Numerous experts in both the public and private-sectors were contacted, including officials at the World Bank, the International Monetary Fund, the United Nations, the Overseas Private Investment Corporation, Lawrence Berkeley Laboratory, and Business International Corporation.

One of the main findings of the literature review and the discussions with experts was that very little has been written specifically about the barriers to private investment in energy conservation. The energy conservation and private investment bodies of literature are voluminous, but there is little overlap between the two, and even less where barriers are concerned. In particular, there is a paucity of quantitative analyses on the impact of the barriers and insufficient discussion of foreign investment and sector-specific barriers. The foreign investment literature does not consider energy conservation-specific barriers, but rather discusses barriers to foreign investment in all fields. Analysis of the energy conservation-specific barriers is most frequently included as part of a broader analysis of energy conservation needs and opportunities. Even in those cases, the barriers are seldom addressed explicitly, but rather are addressed implicitly in discussions of the "prerequisites" or "key ingredients" for successful energy conservation programs.

Barriers Classification System

The literature review and discussions with experts indicate that the barriers to private investment in energy conservation are varied, often interrelated, overlapping and country-specific, and sometimes sector-specific. Hence, any classification system is bound to be somewhat arbitrary and over-simplified. It is still useful, however, to use a system for organizing the barriers. The classification system used in this study was modeled after and builds on the system developed by the World Bank for assessing barriers to industrial energy conservation.[6] The system entails four general categories of barriers; the categories cannot be listed in order of importance, because the nature and severity of the barriers are country- and even sector-specific. The categories are:

- Technical barriers
- Economic barriers
- Financial barriers
- Institutional barriers

Technical barriers were defined as informational and physical constraints to private investment in energy conservation, such as lack of awareness, skills, data, infrastructure, and availability of conservation goods and services.

[6] See Julio Gamba, David Caplin, John Mulckhuyse. Industrial Energy Rationalization in Development Countries. Baltimore: Johns Hopkins University Press, 1986. This report is based partly on material prepared by Hagler, Bailly & Company.

Economic barriers were defined as those factors that affect the economic viability of energy conservation investments, such as low world oil prices and energy prices set below their economic opportunity costs.

Financial barriers were defined as those factors that affect the private sector's willingness and ability to finance economically viable investments, such as lack of internal sources of capital and lack of access to financing on attractive terms.

Institutional barriers were defined as elements of the structure, management, responsibility, and authority of organizations and institutions that inhibit energy efficiency and certain types of laws and regulations, such as lack of energy conservation institutions and high import duties on energy-efficient equipment.

STRUCTURE OF THE REPORT

The report on the study is divided into three chapters:

- Chapter 1 discusses the general and sector-specific barriers to private investment in energy conservation in LDCs that were identified in the literature review and discussions with experts
- Chapter 2 summarizes the policy tools that are available to governments to overcome the barriers and to promote private investment in energy conservation
- Chapter 3 identifies additional research needs and recommends the next steps for USAID in addressing the barriers to private investment in energy conservation in AID-assisted countries.

This study is part of an ongoing effort by the Office of Energy to promote private-sector activity in energy conservation in AID-assisted countries. The study report is intended to stimulate thought and discussion about the barriers to private investment in energy conservation. Comments and suggestions are welcomed and should be directed to:

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This report will be continually revised and up-dated as comments are received and new information becomes available.

CHAPTER 1: BARRIERS TO PRIVATE INVESTMENT IN ENERGY CONSERVATION IN LDCS

In this chapter, the principal barriers to private investment in energy conservation in LDCs are grouped according to the classification system outlined in the Introduction. Whenever possible, specific examples are provided to illustrate the barrier under discussion.

This chapter is divided into two parts: 1) general barriers and 2) sector-specific barriers. Because the barriers to foreign investment in LDCs are generally, not conservation-specific, they are presented in Appendix C, rather than in this section.

GENERAL BARRIERS

Barriers to private investment in energy conservation in all sectors are discussed below. A "checklist" of general barriers, grouped according to the classification system and cross-referenced to the literature, appears in Appendix D.

Technical Barriers

The principal technical barriers to private investment in energy conservation are:

- Lack of awareness of energy conservation need and potential
- Lack of energy data
- Lack of skilled manpower
- Lack of energy conservation goods and services.

These barriers are discussed in more detail below.

Lack of awareness

Industrial managers, farmers, architects and builders, vehicle owners and drivers, and utility companies are frequently unaware of the cost of energy in their activities, of the impact energy conservation could have on profitability, and of the cost and availability of conservation technologies and measures. For example, in a 1984 survey of 349 Thai manufacturing companies, 25

percent did not know what their energy costs were as a percentage of total manufacturing costs, although energy costs were rated among the top three problems facing Thai industry; only 34 percent had estimated their energy savings potential; and less than 10 percent had formal energy conservation programs.[1] Indian farmers usually select the water pumping equipment used for irrigation, but they know little about proper equipment sizing, equipment efficiency, and correct operation. A study conducted in the Indian State of Gujarat indicated that only 10 percent of the farmers knew anything about the impact of improper pump selection and installation on fuel consumption.[2]

Lack of data

The starting point for identifying and designing energy conservation projects is accurate and detailed data on energy demand and supplies. In most LDCs, there is a lack of reliable data at all levels -- national, sectoral, subsectoral, and individual enterprise. For example, El Salvador, Guatemala, Honduras, and Panama lack up-to-date data on energy consumption in at least two sectors -- transportation and rural households. And in Egypt, a USAID consultant team found in 1985 that the managers of the largest industrial plants did not have sufficient data on energy consumption and efficiency to identify the savings potential and design appropriate conservation measures. In addition, energy planners often do not know the minimum data requirements -- the "critical mass" -- that would allow them to identify energy constraints and energy conservation opportunities.

Lack of skilled manpower

There is a serious shortage of architects, engineers, technicians, and managers trained in energy efficient design, operation, maintenance, and management. For example, the World Bank has determined that one of the main reasons for a lack of industrial energy conservation measures in Bangladesh is the shortage of middle management engineers and technicians in almost all industrial facilities.[3]

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[1] See Asian Development Bank. Industrial Energy Audits and Conservation Program for the Royal Government of Thailand. August 1984.

[2] See National Productivity Council. Report on Utilization and Conservation of Energy, Sub-Committee Reports. New Delhi, India, 1983.

[3] See UNDP/World Bank. Bangladesh: Issues and Options in the Energy Sector. Report No. 3873-BD. October 1982.

Lack of energy conservation technologies, goods, and services

Energy conservation technologies, goods, and services (including spare parts) may simply not be available. The shortages may be the result of import restrictions on energy conservation equipment or pricing policies that inhibit the development of a local energy conservation industry. In addition, a poor infrastructure inhibits the distribution and marketing of conservation goods and services, especially in remote areas.

Economic Barriers

The general economic barriers to private-sector investment in energy conservation are:

- Current low world oil prices
- Domestic price distortions
  - energy prices set below their economic opportunity costs
  - distortions in the relative prices of competing energy products
- The small proportion of an energy consumer's total costs accounted for by energy.

Low world oil prices and domestic price distortions are discussed in more detail below.

Low world oil prices

Theoretically, low world oil prices decrease the economic viability of energy conservation investments because the cost of the investment has remained unchanged while the benefit of the investment (i.e., lower energy costs) has decreased. Perhaps more important than the economic impact of low oil prices is the psychological impact; with lower oil prices, the crisis atmosphere of the 1970s and early 1980s has disappeared, as has the sense of urgency to cut energy and foreign exchange costs.

Until recently, however, local energy prices in most AID-assisted countries did not decline, because the value of their currencies depreciated vis-a-vis the U.S. dollar. On a trade-weighted basis, between 1980 and the end of 1984, the U.S. dollar appreciated 51 percent in real terms, increasing the local currency price of oil and more than offsetting the fall in the world price. For example, between 1982 and mid-1985, the real price of fuel oil increased

40 percent in Sudan, 140 percent in Peru and 170 percent in Ecuador. Between the spring of 1984 and the spring of 1985, following a 32 percent devaluation, the price of oil in Jamaica increased from J$86 per barrel to J$127 per barrel.

In March 1985, the U.S. dollar began to depreciate significantly against the Japanese and major European currencies. However, improvements in the value of AID-assisted countries' currencies have been country-specific. For most Central American countries, after substantial depreciations, exchange rates with the U.S. dollar began to stabilize. But in countries such as Indonesia, India, Pakistan, the Philippines, Somalia, and Sri Lanka, exchange rates continued to depreciate against the U.S. dollar through mid-1986.

Domestic price distortions

No matter what path world oil prices follow, the price that affects energy users' decisions is the domestic price of energy products. It is this price that determines the financial attractiveness of energy conservation investments to the private sector.

Energy prices in most AID-assisted countries reflect a history of widespread government intervention. Electricity prices, especially for residential and agricultural customers, are often maintained well below the electric utility's long-run marginal costs (LRMC) of supply. In Pakistan, for example, electricity tariffs are only 50 to 70 percent of LRMC. In Egypt, tariffs are 16 percent of LRMC; in Morocco, 60-70 percent; in Ecuador, 35-60 percent; and in Somalia, 50 percent.

Governments often modify the relative prices of competing energy products by subsidizing one product (generally kerosene, fuel oil, or diesel) with another (generally gasoline). Fuel oil prices are subsidized to promote industrialization and to increase industrial exports; kerosene is subsidized to protect lower income groups; and diesel is subsidized to keep down mass and goods transportation costs and energy costs for agriculture. For example, in the Sudan, diesel prices are 35 to 45 percent less than gasoline prices.[4] Different consumers may also be charged different prices for the same product. For example, in Ecuador, since 1981 the fishing industry has paid 15 to 30 percent less than the regular consumer for diesel oil.[5]

The number of AID-assisted countries that subsidize prices is declining, but it remains high. Subsidies and taxes on domestic energy prices distort market

[4] See Edward N. Krapels. Petroleum Pricing in Developing Countries. June 14, 1985.

[5] ibid.

signals and the relative prices of competing energy products. Not only do subcidies make energy conservation investments unattractive, but they tend to encourage energy waste.

Financial Barriers

The principal financial barriers to private investment in energy conservation are:

- Lack of internal sources of capital
- Lack of access to financing on favorable terms.

These barriers are discussed in more detail below.

Lack of internal sources of capital

Energy conservation investments must compete directly with investments to maintain or expand market share and production. Because of the low visibility of conservation investments -- they do not contribute directly to increased revenues -- management will generally prefer to invest in projects that are directly related to plant expansion or production. For example, a study of industrial energy conservation in India showed that most industrial managers prefer to invest in capital expansion.[6] In addition, managers often use more stringent requirements to evaluate conservation investments than to evaluate other types of investments. In Thailand, for instance, most industrial managers require a 3.7 year payback for investments in conservation, but a 4.5 year payback for investments in new production equipment.[7]

In addition to the low visibility of conservation investments, other factors -- taxes, differences between social and private discount rates, and differences between posted and free market energy prices -- can make the financial return on conservation investments less attractive than the economic return. Thus, "good" conservation projects may not be undertaken because they do not offer a high enough return to the private investor.

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[6] See G. Anandalingam. "Policy Incentives for Industrial Energy Conservation." Energy Management. October-December 1983.

[7] See Gary Gaskin. Thailand: Industrial Energy Conservation and Efficiency. Energy Department, The World Bank, July 1985.

Finally, because many managers are unfamiliar with the concept of life-cycle cost,[8] they evaluate potential investments on the basis of minimum first cost, which can "discriminate" against conservation investments.

Lack of access to financing on favorable terms

When they lack adequate internal sources of capital, private enterprises must turn to external financing for energy conservation projects. In many LDCs, private firms can obtain financing only with high interest rates and short repayment schedules. Several characteristics of conservation investments account for the difficulty in obtaining attractive finance, including:

- Lack of clear cash flow stream: Because conservation projects do not add directly to company revenues, it is often difficult to "see" the cash flow that creates the return on investment and provides for debt repayment. This difficulty in showing the cash flow benefit makes creditors uncomfortable with financing conservation projects.

- Lack of asset security: Conservation projects often involve the installation of customized equipment (especially in the buildings and industry sectors) that would be difficult and expensive to remove and use in another location. As a result, the investment provides little asset security to support external financing.

- Lack of experience with conservation technologies: Conservation projects often involve equipment and processes that are outside the experience of creditors, and for that matter, company management. This lack of experience means that creditors are often unaware of how to evaluate conservation investments and are hence reluctant to support conservation projects.

- Perception of high risk and uncertainty: The risk and uncertainty of recovering conservation investments deter private enterprises from undertaking conservation projects and lenders from financing them. The sources of risk and uncertainty include the lack of clear cash flow stream, the asset security and experience with conservation technologies discussed above, plus the high front-end cost just to evaluate the technical and economic feasibility of the investment; uncertainty about the technical performance of the investment; uncertainty about energy prices, and hence the value of

[8] Life-cycle cost analysis is a method of investment or project evaluation that considers the total of all costs (i.e., initial costs plus all operating and maintenance costs) incurred during the life of the investment or project.

energy savings; and uncertainty about the enterprise's production levels and associated use of the conservation investment.

- Unwillingness to assume fixed repayment obligations: Owing to the perceived risk and uncertainty of energy conservation investments, private enterprises are often unwilling to assume the fixed repayment obligations of a traditional loan.

Institutional Barriers

General institutional barriers to private investment in energy conservation include:

- Lack of government commitment to energy conservation
- Public resistance
- Lack of energy efficiency standards
- Foreign exchange policies and regulations
- Tariff and import restrictions.

These barriers are discussed in more detail below.

Lack of government commitment to energy conservation

Experience has shown that two of the key success factors for energy conservation are top-level government support and the creation of a separate energy conservation institution, with appropriate authority, dedicated full-time staff, access to technical expertise, effective communication and coordination with the private sector, and a conservation plan with specific targets and goals.[9] While several LDCs, including Ecuador, Egypt, India, Ivory Coast, Kenya, Morocco, Pakistan, the Philippines, Thailand, and most Caribbean and Central American countries, have institutional frameworks in place for promoting and implementing energy management and efficiency programs, in most countries the responsibility for promoting energy conservation is fragmented and there is no separate energy conservation organization. For example, Sri Lanka has no one agency that is effectively formulating a national energy conservation policy or coordinating the work of the various organizations that are active in the energy field. In Peru, there are three

[9] See Henri-Claude Bailly. "Energy Conservation Program Implementation: The Key Success Factors." Paper presented at Energy Conservation Seminar, January 14-17, 1985, Alajuela, Costa Rica. Sponsored by Office of Energy and Bureau for Latin America and the Caribbean, USAID, under ECSP.

institutions involved in promoting energy efficiency in the industry sector alone: Ministry of Industry, Ministry of Energy and Mines, and the Institute for Industrial Technology Research and Technical Standards.

Public resistance

It is difficult to change ingrained, energy-inefficient attitudes and behavior. Groups will oppose changes in regulations or policies that encourage private investment in energy conservation if those changes threaten their interests. For example, public resistance will be especially strong to increases in energy prices, as illustrated by the riots in recent years in Egypt, Morocco, Tunisia, the Dominican Republic, Jamaica, and Ecuador.

Lack of energy efficiency standards

Energy-using equipment (e.g., electric motors, vehicles, boilers, HVAC systems) comes from a variety of foreign and domestic sources and is often not subject to design or efficiency standards. LDC commodity imports may be tied to bilateral foreign assistance programs that require that the equipment originate in the donor country. To keep costs down, manufacturers in donor countries often have less stringent standards for equipment destined for LDCs than for those marketed in their own countries. Hence, implementing standards for imported energy-using equipment and vehicles can be a daunting prospect.

Foreign exchange policies and regulations

Energy conservation investments in LDCs frequently have a high foreign currency content -- 80 percent or more -- because of the need to purchase specialized equipment and engineering services from abroad. However, since foreign exchange resources are scarce, most LDCs regulate the buying and selling of foreign exchange and give parastatals or authorized monopolies (such as electric utilities) priority access. To further restrict private access to foreign exchange, governments often require import licenses. As a result, foreign exchange is generally not available to private enterprises to import new, more energy-efficient equipment.

Tariff and import restrictions

Because of the scarcity of foreign exchange and a desire to protect domestic industries, governments often impose discriminatory tariffs and strict import controls on durable goods, including energy-efficient equipment. In some countries, tariff levels on energy efficiency equipment are as high as 50 to

100 percent of the equipment purchase costs (e.g., Thailand). The tariffs tend not to take efficiency of use into account and are generally proportional to the FOB price. Tariffs on imported energy-efficient equipment reduce the expected financial performance of energy conservation investments and make it less likely that they will be financed. In addition, by reducing or eliminating foreign competition, import restrictions protect domestic industries and thus decrease the incentive for cost efficiency in general and energy efficiency in particular.

SECTOR-SPECIFIC BARRIERS

The barriers that apply to private investment in energy conservation in specific sectors are discussed below. In most cases, sector-specific barriers are "subsets" or sectoral examples of the more general barriers. A "checklist" of the sector-specific barriers, grouped according to the classification system and cross-referenced to the literature, is presented in Appendix E.

Industry-Specific Barriers

Industry-specific barriers to private investment in energy conservation include:

Technical

- There are insufficient data on energy use by enterprise, product and energy source; on fuel costs; on production levels; and on plant size.
- There is a lack of engineering, audit, and consulting manpower within and outside industrial facilities.

Economic

- The price of manufactured goods are often set on the basis of estimated production costs. This "cost-plus" pricing system means that if energy costs decrease, so do product prices, and vice versa. Because neither the benefits of saving energy nor the costs of energy waste accrue to industry, industrial managers have little incentive to conserve. Examples of cost-plus pricing can be found in Peru, Sri Lanka, India, and Egypt.

Institutional

- Industrial managers are hesitant to interrupt production flows to retrofit equipment.
- Industrial managers are reluctant to share information on production efficiency improvements with competitors.
- Cost-effective industrial energy conservation measures can conflict with existing regulatory mechanisms. For example, in many LDCs, fuels for industrial use are rationed, and an industry's allocation depends on consumption in the previous year. Thus, it often pays for a firm to use more energy to be assured of an adequate future supply.

Agriculture-Specific Barriers

Agriculture-specific barriers to private investment in energy conservation include:

Technical

- Information on traditional energy consumption (e.g., animal and crop wastes, human and animal power) in agriculture is sparse.
- There are insufficient data to estimate total energy use by the sector or to accurately identify where the energy is being consumed. For example, energy use in agriculture was not even included in Sri Lanka's most recent energy balance because no information was available.
- Pumped irrigation systems require large amounts of power and are often the predominant load in rural areas. For example, in Pakistan, nearly 25 percent of the power generated is used for irrigation. Along the middle and upper sections of the Senegal River Valley, over 90 percent of the power generated is used for irrigation pumping. Evaluation and selection of the most energy-efficient, reliable irrigation pumping system are hindered by a lack of data on the comparative technical and economic performance of various pumping options (e.g., diesel v. electrified pumping).[10]

[10] To address this barrier, the Office of Energy, in cooperation with the United Nations Food and Agriculture Organization and major European donors, is preparing a handbook entitled Guidelines for Comparative Analysis of Technical and Economic Performance of Water-Pumping Systems.

Economic

- Electricity tariffs and diesel fuel costs (both for irrigation pumps and farm equipment) are almost always heavily subsidized. In Indonesia, for example, diesel fuel for farm tractors is subsidized. In India, the energy consumption of a "typical" electric irrigation pump could be reduced by an estimated 25 percent to 30 percent through a number of straightforward measures, such as replacement of undersized pipes and fittings, proper sizing of motors and pumps, operation of pumps at correct speeds, and better water management, which could all be implemented immediately. However, low electricity tariffs to agricultural customers in India discourage investments in efficiency improvements.[11]

Institutional

- National and donor agencies have yet to treat agriculture and energy as related issues. Hence, there is a general lack of understanding of energy use in agriculture, inadequate coordination between energy and agriculture institutions, and a lack of energy planning in agriculture. In Sri Lanka, for example, there are at least 10 government institutions and organizations at the national, district, and local level involved in agriculture and energy.[12]

Transportation-Specific Barriers

Transportation-specific barriers to private investment in energy conservation include:

Technical

- There is a lack of information on energy use by different transport modes, and on the relationship between energy use and vehicle maintenance, driver behavior, and fuel efficiency.

- There is little information on truck load availability, but many trucks run less than fully loaded and return empty. Regulation of

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[11] See National Productivity Council. Report on Utilization and Conservation of Energy, Sub-Committee Reports. New Delhi, India, 1983. Also see Howard Geller. Improving End-Use Electrical Efficiency: Options for Developing Countries. Final Report prepared for Energy Department, The World Bank, July 1986.

[12] Office of Energy, USAID. Energy for Agriculture. Project Paper, Project Number 936-5731, 1985.

the trucking industry can lead to low average load factors if it encourages the rapid growth of "own account" transport unable to take loads on return trips.[13]

- There is a lack of skilled mechanics and technicians to make technical improvements and maintain equipment.
- There is a lack of spare parts.
- Drivers are not trained to operate vehicles in an energy-efficient manner.
- In some cases, fuel quality is poor.
- The scrapping rates of vehicle fleets are low. Hence, opportunities for fuel-switching and the introduction of more fuel-efficient vehicles are limited in the short-term.

Economic

- The existence of high income elasticities and low price elasticities in the transportation sector means that as incomes increase, so will energy demand, but that price increases will not be effective energy conservation tools.

Financial

- Energy-efficient vehicles are generally more expensive than less efficient vehicles, and hence more difficult to finance.

Institutional

- There is a general lack of coordination of energy, transportation, and urban planning. Because of the multiplicity and variety of energy users -- cars, buses, trucks, trains, ships, planes -- and responsible organizations in the transportation sector, it is difficult to design effective national transportation conservation programs. In Portugal, for example, responsibility for transportation energy conservation is divided between the Ministries of Transportation and Energy, which tend to make decisions on fuel and vehicle taxes without consideration of conservation objectives. In addition,

[13] See Joy Dunkerley and Irving Hoch. Transport Energy: Determinants and Policy. Final Report prepared for Office of Energy, USAID, September 1985.

regional and local officials in Portugal assign a low priority to transportation energy conservation.[14]

- Higher incomes stimulate demand for more flexible and convenient transportation service and for more leisure-related transportation. Both lead to increased private-car ownership.

- Traffic management is generally poor, with poor route selection, low load factors, regulations on backhauling, unsatisfactory bus service, and inability to enforce traffic laws.

Buildings-Specific Barriers

Buildings-specific barriers to private investment in energy conservation include:

Technical

- There is a lack of data on energy consumption by type of energy, service, and building category.

- There is a lack of engineers, architects, builders, and technicians trained in energy-efficient design, construction, installation, and maintenance. For example, in most ASEAN countries there are no courses on energy-efficient building design.

- There is a lack of insulation materials and heat pumps.

Institutional

- There is usually a large public housing sector that is concerned with providing low-cost housing. Construction decisions seldom take energy efficiency into consideration.

- There is an inherent landlord/tenant conflict of interest. If the landlord pays utility bills (mostly for air conditioning), there is little incentive for the tenant to conserve; if the tenant pays utility bills, there is little incentive for the landlord to make energy conservation improvements.

- The highly fragmented nature of the sector and the great number of actors -- building owners, occupants, architects, builders,

[14] See UNDP/World Bank. Energy Issues and Options in Thirty Developing Countries. Report No. 5230. August 1984.

ventilation and cooling equipment contractors -- make energy conservation coordination and decision-making difficult.

- Many LDCs do not have building codes. When building codes do exist, they are often not enforced.
- Building codes and practices often conflict with energy-efficient design and operations.

Electric Power-Specific Barriers[15]

There are two categories of electric power producers in LDCs: 1) large-scale utilities, mostly government-owned, and 2) small-scale (including cogeneration) power generation facilities, mostly privately owned. These two groups face different types of barriers to private investment in conservation and are therefore treated separately.

Large-Scale, Government-Owned Utilities

Barriers to private investment in energy conservation in large-scale utilities include:

Technical

- Coordination of data gathering and bookkeeping are poor. While utilities keep track of electricity production and sales, they seldom bring the two together to assess system efficiency.
- Electric utilities lack skilled manpower, especially competent engineers. This is often because they tend to pay their employees poorly. For example, one of the major reasons for the outflow of professionals and technically skilled personnel from Peru's power sector during the 1970s was the utility's non-competitive pay scale.[16]

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[15] For the purposes of this discussion, electric-power specific barriers are defined as barriers to private investment in conservation in electricity generation, transmission and distribution. Barriers to conservation in electricity end-uses are included in the discussion of general and industry-, agriculture-, and buildings-specific barriers.

[16] See UNDP/World Bank. Energy Issues and Options in Thirty Developing Countries. Report No. 5230. August 1984.

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Institutional

- Most utilities in LDCs are government-owned. In fact, there are only two privately owned utilities in AID-assisted countries, both in India.

- There is often a multitude of regulatory authorities and distribution agencies, and coordination is poor. In Sri Lanka, for example, the Ceylon Electricity Board is the principal power supply agency, but one-quarter of its output is sold to 218 local authorities, which distribute electricity to local consumers. In Morocco, responsibility for electricity distribution is divided between the National Electricity Office and approximately 10 local public utilities.

- Electric utilities focus more on building new power plants than on improving the operation of existing plants and promoting electricity use. For example, while Honduras has excess capacity, the utility has not expanded the grid.

Cogeneration and Small-Scale Power Generation

Barriers to private investment in cogeneration and small-scale power generation (less than 30 MW) include:

Technical

- Utility and industrial managers are unfamiliar with cogeneration and independent power options.

- There is a lack of power experts outside the large, government-owned utilities.

- Because cogeneration and small-scale power systems are new and unfamiliar, the most suitable demonstration systems and appropriate equipment and spare parts are often unavailable.

Economic

- Low world energy prices favor large utilities, which tend to use coal or oil, over small-scale, private systems, which more often use renewable energy sources (e.g., small hydro, biomass).

- Because public utilities are subsidized, it is difficult for private power systems to compete.

Financial

- The magnitude of power investments makes them much more difficult to finance than other conservation investments. The total installed cost of a "typical" small-scale power plant (5 MW) is on the order of $10 million, whereas other conservation investments usually cost less than $1 million.
- There are no well-developed sources of long-term financing for investments in private power systems.
- Public utilities have priority access to low-cost capital.

Institutional

The institutional framework is inadequate for promoting and regulating private power investments:

- There is no institution to coordinate private-sector power generation.
- There is seldom a specific policy for private investment in the power sector and usually no pricing policy for privately generated power.
- Because public utilities have a monopoly on the generation, transmission, and distribution of electricity, the independent producer must either sell power directly to the utilities or use the utilities' network to sell to other customers. However, there is generally no framework for transactions with the private sector. In Thailand and Pakistan, for example, there are no provisions for the purchase of power from independent generators.[17].
- Restrictive legislation and regulations often discourage private power generation. In India, for example, the state electricity boards impose a duty on self-generated power, which deters many industries from investing in cogeneration systems.[18]

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[17] See Hagler, Bailly & Company, assisted by Arthur D. Little. Private-Sector Power Generation: Potential, Impediments, and Policy Issues in Pakistan. Final Report. Prepared for Office of Energy and Bureau for Asia and Near East, USAID, under ECSP, June 1986. Also see Hagler, Bailly & Co. Private-Sector Power Generation in Thailand: Potential, Impediments, and Policy Issues. Draft Final Report. Prepared for Office of Energy and Bureau for Asia and Near East, USAID, under ECSP, September 1986.

[18] See National Productivity Council. Report on Utilization and Conservation of Energy - Subcommittee Reports. New Delhi, India, 1983.

- The private sector often doubts the government's commitment to private-sector power generation. Private-sector parties in Pakistan, for instance, are concerned that the government's enthusiasm for private participation in the power sector will be short-lived.

CHAPTER 2: ENERGY CONSERVATION POLICY TOOLS AND THEIR EFFECTIVENESS

This chapter summarizes the policy tools that are available to governments to overcome the barriers to private investment in energy conservation. It also discusses what has been learned about the effectiveness of these policies in both developed and developing countries.

Governments can exercise a broad range of powers and policy instruments -- price and non-price mechanisms -- to remove market and non-market barriers to energy conservation and to make energy conservation investments more attractive to the private sector. After more than 10 years of experience with energy conservation, a great deal has been learned about the appropriateness and effectiveness of these policy measures. Industrialized countries have already worked with these policy tools and their experience offers valuable lessons for developing countries. More recently, several of these tools have also been tested in developing countries.

Perhaps the most important government action -- one that seems obvious, but is often overlooked -- is a high-level commitment to and leadership of energy conservation. A government endorsement of energy conservation, together with a political mandate to promote energy conservation, is the starting point for effective energy conservation policies. Other policy instruments -- price and non-price tools -- are summarized below.

PRICE TOOLS

If policy tools were ranked in terms of their general effectiveness in promoting energy conservation investments, correct pricing signals would undoubtedly be at the top of the list. Energy pricing is clearly the single most important element in energy resource allocation and energy efficiency. Ideally, energy product prices should reflect their economic opportunity costs. The recent fall in world oil prices provides AID-assisted countries with an opportunity to move toward more economically efficient energy pricing without jeopardizing other development objectives. This opportunity is especially great for countries that have subsidized certain petroleum products to protect the more vulnerable segments of the population or to promote the development of certain sectors (e.g., agriculture, export or import substitution industries).

Experience has shown, however, that pricing policies are extremely resistant to change; the rationalization of energy prices is far easier said than done. Energy prices are determined as much by political and social objectives and influences as by considerations of economic efficiency. Because of the

multiple objectives of pricing policies (e.g., economic efficiency, government revenue, social equity) and their far-reaching effects, it is economically difficult and politically risky for governments to move toward more efficient energy prices.

NON-PRICE TOOLS

Because real world constraints often prevent the application of efficient energy pricing, non-price incentives for private investment in energy conservation have become extremely important. Even when price signals are economically "correct," other incentives may be necessary to overcome other distortions and non-market barriers.

Financing Incentives

Experience in many developing countries has shown that the barrier to private investment in energy conservation is not so much the lack of capital as the lack of access to capital on terms that are sufficiently attractive to the private sector. Thus, government energy conservation policies will often need to include specific provisions for financing. However, because experience in this field is limited, it is unclear which mechanisms work best in developing countries.

Financing incentives have become more important with lower world oil prices, since the lower prices have reduced the private rate of return on energy conservation investments. Potential financing incentives include:[1]

- Grants/cost-sharing for technology demonstration
- Grants/no-risk loans for audits and preliminary engineering studies
- Subsidized-interest loans
- Revolving credit funds
- Loan guarantees
- Insurance programs for project technical performance

[1] For a more detailed discussion of traditional financial incentives for conservation projects and some of the considerations in developing a comprehensive financial assistance program, see Bailly, Henri-Claude and Michael Fisher "Financing Energy Conservation Investments: Issues and Traditional Approaches." Paper presented at USAID-sponsored Energy Conservation Seminar, January 14-17, 1985, Alajuela, Costa Rica.

Grants/cost-sharing for technology demonstration

Technology demonstration is often perceived as risky in a developing country, even though a conservation technology may have been successfully applied and widely accepted in other countries. For this reason, the government must often pay all or a substantial share of the cost of installing a conservation technology for first-time application in a country. The share of a project's cost that might be borne by the government could range from 25 percent to 80 percent, depending on the degree of risk of the project. In developing countries, the grant will often be intended specifically for the foreign exchange component of the project.

A demonstration grant program is generally very effective in introducing new technologies to a country, because it directly offsets the capital outlay burden that must be borne by a company as it undertakes a conservation project and, accordingly, eliminates the risk of capital loss. In addition, the expected financial performance of a project is likely to be improved by a grant.

The greatest drawbacks of this type of program are the substantial cash outlays that the government may have to make; the administrative costs and difficulties of establishing grant programs; and the difficulty of evaluating private-sector applications for such grant assistance. Of 11 countries that have used various incentives to promote energy conservation investments, only the Philippines has offered demonstration grants (see Exhibit 1).

Grants/no-risk loans for audits and preliminary engineering studies

Experience indicates that grants are most effective at the early stages of an energy conservation project, when there is the most risk and uncertainty. Although the outlay for audits and preliminary engineering studies is generally the least expensive part of an energy conservation project, it is at this point that the least is known about the potential benefits of the project. Hence, private investors are often reluctant to make even a relatively small cash outlay. To overcome this aversion to risk, several governments have provided grants or no-risk loans for audits and preliminary engineering work. The no-risk feature of a loan means that the company is obligated to repay the loan only if the audit/engineering studies identify conservation opportunities that meet specified criteria. These loans are most effective when they are interest-free or at below-market rates.

Grants and no-risk loans for audit/engineering studies have been used in several developing countries, including Costa Rica, Dominican Republic, Korea, Panama, the Philippines, Sri Lanka, and Thailand (see Exhibit 1).

EXHIBIT 1

EXAMPLES OF DEVELOPING COUNTRIES THAT HAVE USED POLICES FOR CONSERVATION INVESTMENTS

Countries	Incentives									
	Demonstration grants	Grants/no-risk loans	Low interest loans	Revolving credit funds	Loan guarantees	Performance insurance	Tariff reduction	Tax incentives	Standards/ labeling	Mandatory requirements
Costa Rica										
Dominican Republic		*	*	*						
India							*	*		
Jamaica				*						
Korea		*								*
Panama		*								
Philippines	*	*	*				*	*	*	
Portugal										*
Singapore										
Sri Lanka		*							*	
Thailand		*	*				*			

In most instances, the programs have resulted in energy efficiency improvements that would otherwise not have been identified. The programs are thus highly effective in leveraging a relatively small amount of government funds to encourage a substantial capital outlay in energy efficiency improvements. Most industrialized countries have gradually phased out the grant element and replaced it with other types of incentives.

The major problem in implementing this type of program is the administrative burden.

Subsidized-interest loans

Subsidized-interest loans enable energy users to obtain credit for energy efficiency improvements at a lower cost of capital than would be obtained if they borrowed from financial institutions at market rates. A lower interest rate improves the expected financial performance of the project. Governments have sometimes coupled subsidized interest rates with more lenient repayment terms.

Subsidized-loan programs have been used in several developing countries, including the Dominican Republic, India, the Philippines, and Thailand (see Exhibit 1), with varying degrees of success.

The main weakness of these types of programs is that the actual capital cost is not reduced; only the financing cost is lowered. Nevertheless, this level of subsidy may be adequate to promote projects that appear marginal to the private sector.

Revolving credit funds

The principal objective of revolving credit funds is to provide a protected reserve for energy conservation project financing that cannot be appropriated for other purposes. Funds are lent for qualified projects either directly by the government or through financial institutions. As loans are repaid or as additional funds become available through accruals to the fund, additional loans can be made.

A few developing countries have implemented revolving credit funds, including Jamaica and the Dominican Republic (see Exhibit 1). The Indian government is actively considering a $100 million revolving loan fund for energy conservation projects, and the government of Sri Lanka plans to establish an energy conservation fund under the Ministry of Power and Energy. The results, however, have been disappointing. In most cases there has been little private-sector demand for the funds because interest rates have not been

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sufficiently below market rates to offer an adequate incentive. Another disadvantage of this type of program is its administrative burden.

Loan guarantees

Many financial institutions in developing countries perceive energy conservation projects as being risky and uncertain and they may therefore be reluctant to make loans for such projects. One way of reducing the perceived risk to private-sector creditors is through a loan guarantee program in which the government serves as guarantor on qualifying loans. Qualifying loans will typically be for a fairly high percentage (e.g., 80 percent) of a project's capital cost and the government will typically guarantee a fairly high percentage of the loan (80 percent to 90 percent).

Loan guarantees are most effective in cases where the project is financially attractive to the private sector, but where lenders are reluctant to extend credit because of unfamiliarity with conservation projects or concern about the stability of the borrower. Because loan guarantees provide little if any subsidy, they will not promote development of marginal projects. One of the major advantages of this type of incentive is the relatively low cost to the government.

There is little developing country experience with energy conservation loan guarantees.

Insurance programs for project technical performance

Another way of reducing the perceptions of uncertainty and risk is to develop a technical performance insurance program. The insurer (either the government directly or a private insurer working for the government) would guarantee that a project would meet specified standards. If the project failed to perform, the insurer would either bring the project up to the specifications or compensate the energy user for the loss in value of energy savings. As a result, energy users and creditors should have less concern about the technical uncertainties and risks associated with conservation project performance.

This type of program could be operated at little net cost to the government. The cost would depend on the extent to which the government operated the program as a subsidized activity. If the government developed the program on its own, the administrative costs would be high. There has been little if any developing country experience with this type of program. Private insurers in the United States offer performance insurance and the government itself has considered sponsoring performance insurance programs for projects as risky and costly as synthetic fuels development.

Various innovative financing mechanisms, such as shared savings arrangements, energy service agreements, joint ventures between energy users and external investors, and variable payment and limited-term, guaranteed-payback loans, may offer potential for encouraging energy conservation.

Reducing or Eliminating Tariffs and Import Restrictions

Another way to increase the financial attractiveness of energy conservation investments is to eliminate or substantially reduce tariffs and import restrictions (including restrictions on private access to foreign exchange) on energy-efficient equipment. Conservation investments frequently have a high foreign currency content (e.g., as high as 80 percent) because of the need to import specialized equipment and technical and engineering services. Because of foreign exchange scarcity and a desire to protect domestic industries, governments often impose discriminatory tariffs and strict import controls on durable goods, including energy-efficient equipment.

In cases where tariffs and import restrictions have been imposed to protect and promote the development of a local industry, the government needs to carefully weigh the benefits of protecting a particular industry against the economic costs of decreased cost efficiency in general and decreased energy efficiency in particular. If the government thinks that domestic protection is justified, the tariffs or duties should be established at the lowest possible level to allow the industry to develop in a competitive environment. In most AID-assisted countries, however, there is no domestic supply of energy-efficient equipment and the government would do better to encourage the importation of the best such equipment by lowering tariffs and duties, and perhaps granting priority access to foreign exchange for industries making energy conservation investments.

The extent to which these measures will make conservation investments more attractive to the private sector will depend on the reduction in the tariff/duty burden. If conservation-related imports are already subject to low tariffs, reducing or eliminating tariffs will have little impact on private investment in conservation. In some developing countries, however, the tariff levels are as high as 50 percent to 100 percent of the equipment purchase cost. In these cases, eliminating or reducing tariff levels and duties would improve the expected financial performance of energy conservation projects and make it more likely that they will be financed. Use of differential tariff rates on the basis of proposed end-use does, however, raise the problem of importers trying to use the preferential rates for equipment that will be used for purposes other than improving energy efficiency.

Some AID-assisted countries have reduced or eliminated tariffs and duties for conservation-related imports (see Exhibit 1). India has reduced or eliminated duties for energy conservation equipment such as microprocessor-based

instruments and diagnostic fuel efficiency instruments. In Thailand, the import duty on energy-efficient equipment has been lowered by one-half or to 10 percent, whichever is the greater reduction. In the Philippines, energy management systems, efficient motors, lighting products, air conditioning systems, and other conservation technologies are exempt from import duties.

Tax-Related Incentives

The use of tax-related incentives, including investment tax credits, accelerated depreciation of conservation investments, and tax holidays, is another way to make energy conservation investments more financially attractive to the private sector. These incentives reduce the taxes that would otherwise have to be paid by an energy user that has made an energy efficiency improvement. As a result, the implicit capital cost of the project is reduced and the expected financial return will be higher.

In general, tax incentives have not performed well. A recent study of energy conservation policies in IEA member countries found that in most cases, tax incentives had not been very effective in encouraging incremental conservation investments.[2] Tax incentives function as part of the tax code of a country and thus will only be effective if the tax code itself is enforced and complied with. In addition, because of their traditional design, tax incentives benefit only those companies that already have a substantial tax liability. Hence, tax incentives are more likely to encourage multinational corporations than local firms to invest in energy conservation. These types of incentives do have the advantage of not requiring active administration by the government. However, this feature also increases the likelihood that tax-related incentives will be used fraudulently or for applications that require no subsidy. In fact, the chief criticism of the 10-percent energy investment tax credit in the United States was that it was generally used for projects that would have been implemented without the credit. Nevertheless, the use of limited tax incentives may be helpful in individual developing countries.

A few developing countries, including the Philippines and India, are experimenting with tax-related incentives (see Exhibit 1). The Indian government is currently offering all three types of traditional tax incentives: a 25-percent investment tax credit for cogeneration; depreciation over one year of 100 percent of capital investments in energy conservation, including cogeneration; and a reduction in corporate income tax rates for firms that implement conservation programs.

[2] International Energy Agency, Conservation Sub-Group, "Energy Conservation Policy Study," Draft Final Report, June 1986.

Tax-related penalties can also be used to encourage energy conservation. The concept of "luxury" taxes on electric appliances or motor vehicles could be applied specifically for the purpose of discouraging wasteful energy consumption. In the Philippines, for example, higher taxes are imposed on the purchase of cars with larger engines.

Standards and Labeling

To ensure that energy-using equipment operates efficiently, it should be subject to design and operating standards. And buildings should have minimum thermal efficiency levels, heating system efficiency levels, individual metering in multi-occupancy buildings, boiler maintenance requirements, and restrictions on air conditioning. Because of the long life span of new buildings, strict building codes can lead to significant energy cost savings in the long term.

Energy efficiency standards have been established in many countries for boilers, furnaces, kilns, dryers, and for electric power factors.[3] Some developing countries have implemented energy efficiency standards for buildings and motor vehicles, and labeling programs for appliances (see Exhibit 1). For example, to decrease electricity consumption in buildings, Singapore adopted efficiency regulations for new commercial buildings in 1979. Existing buildings were also required to meet efficiency standards or be penalized on their electric bills. These standards have decreased electricity use in buildings by an estimated 6 percent to 10 percent.[4] Sri Lanka has efficiency standards for motor vehicle engines. In 1984, the Philippines initiated a program for labeling the energy efficiency of air conditioners.

Energy efficiency standards and labeling requirements are most cost-effective for large energy-consuming buildings and equipment. However, enforcement of standards is a problem. Standards for individual appliances and products are more costly to establish, and enforcement is even more difficult. Nonetheless, in most cases it is worthwhile for governments to review existing standards and to consider ways to provide purchasers with better information on and more reliable standards for the efficiency, fuel consumption, and operating costs of boilers, electric motors, vehicles, and other equipment.

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Mandatory Efficiency Requirements and Regulations

Experience in several industrialized countries and certain developing countries, such as Korea (see Exhibit 1), suggests that mandatory energy efficiency requirements and regulations can be extremely effective in promoting energy conservation. Some countries have required that industrial firms of a certain size appoint energy managers. In Japan, for example, the appointment of energy mangers is required by law for factories whose energy consumption is over a fixed threshold. These energy managers have the authority to overrule production managers to ensure good energy practices. Portugal also has a mandatory energy manager program for firms that consume more than 1,000 metric tons of oil equivalent per year. Portuguese firms are required to implement an energy management service, have their energy use patterns examined every 5 years, and develop 5-year plans for rational energy use, which must be approved by the government. The political feasibility of mandatory measures is country-specific and likely to be most effective where the government has traditionally played a more paternalistic role.

COUNTRY-SPECIFIC POLICY STRATEGIES

There is no "magic" energy conservation policy strategy. To determine the most appropriate and effective mix of policies, each country must assess its particular development needs, priorities, resources, and capabilities and set its own energy conservation objectives. The options chosen will depend as much on the structure of the economy and the political and social philosophy of the government as on the specific barriers to private investment in energy conservation.

Experience has shown that, in general, the most successful national energy conservation policies have been those that are part of a well-balanced, comprehensive energy conservation strategy that includes a public-private partnership and a mix of policies that address general and specific technical, economic, financial, institutional, and political barriers. Thus, the policy tools summarized above need to be integrated into a country's overall policy framework and complemented by other measures, such as information dissemination and public awareness campaigns, data gathering, technical assistance and training, sponsorship of research and development, and continuous monitoring and evaluation of energy conservation policies and programs.

CHAPTER 3: ADDITIONAL RESEARCH NEEDS AND NEXT STEPS FOR USAID

The current world oil market situation provides USAID and AID-assisted countries with a unique opportunity to reexamine and redesign energy conservation policies. These policies are critical to overcoming the barriers to private investment in energy conservation and creating an attractive investment climate. This chapter identifies additional research needs and recommends next steps for USAID in addressing the barriers to private investment in energy conservation in AID-assisted countries.

ADDITIONAL RESEARCH NEEDS

One of the main findings of the literature review and discussions with experts is that there has been little formal analysis of the barriers to private investment in energy conservation in LDCs. There is a paucity of quantitative, country- and sector-specific, and foreign investment analyses. There has also been little discussion of "success stories" -- countries that have been successful in encouraging private investment in energy conservation. Hence, research efforts should focus on:

- Quantifying the impact of the barriers on the economies of AID-assisted countries
- Identifying and analyzing country- and sector-specific barriers
- Identifying and analyzing energy conservation-specific barriers to foreign investment.
- Identifying countries that have been successful in encouraging private investment in energy conservation (e.g, Korea, Thailand), analyzing their programs, determining their replicability in AID-assisted countries, and preparing country case studies to be distributed to the missions.

NEXT STEPS FOR USAID

Although increasing the role of the private sector is a cornerstone of USAID's development strategy, the human and financial resources available for promoting private-sector initiatives are extremely limited. Hence, the Office of Energy cannot address all the barriers to private investment in energy conservation in all AID-assisted countries. Rather, it needs to focus its

efforts on those barriers and those countries where the need, the potential impact, the likelihood of success, and the potential for replicability are the greatest.[1]

To make this determination, USAID must first identify and analyze the barriers in individual AID-assisted countries. To this end, the Office of Energy has designed and distributed a survey to gather current information on country-specific policies or practices that may inhibit or encourage investment in energy conservation. This two-part survey appears in Appendix F.

The results of the survey will provide USAID with a comprehensive and timely "database" of country-specific policies and practices that affect investment in energy conservation projects and programs. This database will enable USAID to take its first systematic look at all the potential areas for energy policy reform in AID-assisted countries and will serve as the basis for defining a private-sector strategy for energy conservation. The survey results can then be used to target USAID's energy policy reform and private sector promotion efforts using the methodology and criteria described below.

Identify Key Policy Barriers

The criteria for identifying key policy barriers will be:

1. The severity of the barrier, which will be determined by:
   - The number of AID-assisted countries where the barrier exists
   - The relative impact of the barrier on each country where it exists.
2. The likelihood of successfully removing the barrier, which will be determined by, among other factors:
   - USAID's expertise and leverage
   - The cost of removing the barrier

[1] AID has taken a major step toward addressing the barriers to private investment in energy conservation in Asia and the Near East. The Office of Energy and the Bureau for Asia and the Near East jointly sponsored a regional workshop to expand private-sector participation and investment in energy conservation and power generation. The workshop was held in Bangkok, Thailand from September 29 to October 3, 1986. The workshop proceedings, including the full text of papers presented at the workshop, will be available from the Office of Energy, the Bureau for Asia and the Near East, and Hagler, Bailly & Company by December 1, 1986.

- The political sensitivity of removing the barrier.

The result of this analysis will be a numerical ranking of the key barriers to private investment in energy conservation in AID-assisted countries.

Identify Priority Countries

The criteria for identifying priority countries will be:

1. The need to address the barriers, which will be determined by:
   - The country's energy conservation need and potential (see Appendix G)
   - The country's priority for USAID (proxy would be level of assistance country receives from USAID - Appendix H)
   - The severity of the barriers in the country (based on ranking of the impact of the barriers above).
2. The likelihood of success, which will be determined by:
   - Whether the country has a generally active private sector (proxy would be the private sector's share of domestic credit - Appendix I)
   - Whether the government is sympathetic to enhancing the private sector's role in the economy in general and in energy conservation in particular
   - Whether the government is committed to energy conservation (e.g., does an energy conservation institution and plan exist?).

The result of this analysis will be a numerical ranking of priority countries for Office of Energy efforts to address the key barriers to private investment in energy conservation.

APPENDIX A: BIBLIOGRAPHY ON BARRIERS TO PRIVATE INVESTMENT IN ENERGY CONSERVATION IN LDCS

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APPENDIX B: LIST OF CONTACTS

This appendix presents a list of the individuals contacted during the preparation of this report. For each individual, his or her affiliation and the rationale for including his or her inputs in this report are noted.

U.S. Government/National Laboratories:

- Joy Dunkerley - Presently with the Office of Technology Assessment (on leave from Resources for the Future, where she is a Senior Fellow). She has written extensively on energy problems and prospects of developing countries. Called to discuss relevant studies on energy conservation.

- Andrea Ketoff - Energy and Environment Division, Lawrence Berkeley Laboratory. Works closely with Lee Schipper, who has worked for many years in the field of energy conservation in LDCs. Called to identify reports, research and other experts on private investment in energy conservation.

- Marshall Monarch - Argonne National Laboratory. He worked on AID energy project in Egypt. Called to discuss barriers to private investment in energy conservation in Egypt.

- Jayant Sathaye - Energy Analysis Program, Lawrence Berkeley Laboratory. He has worked on USAID, ADB, and UN projects and research to promote energy conservation in buildings and industry in LDCs.

- Paul Stern - Study Director, Committee on Behavioral and Social Aspects of Energy Consumption and Production, National Research Council, National Academy of Sciences. Has written extensively on consumer energy decisionmaking, focusing on behavioral processes. Recently published a book on energy conservation and human behavior.

- Harold Weisman - Energy Information Administration. Identifies and prepares local petroleum product prices for the International Energy Annual.

- Tom Wolsko - Argonne National Laboratory, Project Manager for Energy Policy and Renewable Energy Field Testing Program in Egypt. Called to discuss barriers to private investment in energy conservation in Egypt.

International Organizations

- John Borthwick - Energy Strategy and Preinvestment Division, Energy Department, World Bank. Called to discuss efforts to overcome barriers to energy conservation in Thailand.
- Trevor Byer - Energy Policy and Advisory Division, Energy Department, World Bank. Called to discuss efforts to overcome barriers to energy conservation in Thailand.
- John Mulckhuyse - Industrial Restructuring and Efficiency Division, Industry Department, World Bank. He supervises World Bank industrial energy efficiency programs and recently co-authored a book on industrial energy rationalization in LDCs.
- Gary Gaskin - Energy Strategy and Preinvestment Division, Energy Department, World Bank. Has worked extensively in energy efficiency and conservation.
- Ian Glenday - Acting Manager, Energy Unit, Engineering Department, International Finance Corporation. Called to discuss whether IFC has financed energy efficiency projects and to identify success stories.
- David Goldsbrough - Developing Country Studies Division, Research Department, International Monetary Fund. He has prepared several studies on private investment in LDCs.
- Keith Marsden - Industrial Strategy and Policy Division, Industry Department, World Bank. He has studied the importance of private sector development in LDCs.
- Frank Pinto - Interregional Energy Adviser, Natural Resources and Energy Division, Department of International Economic and Social Affairs, United Nations Development Program. Called to discuss UN work in energy conservation.
- Gabriel Roth - Studies Unit, Economic Development Institute, World Bank. He has worked and written extensively on the role of the private sector in providing public services in LDCs.
- Edith Ward - Transnational Corporations Affairs Officer, Advisory and Information Services Division, United Nations Center on Transnational Corporations. Called to request studies on host/home country policies toward private investment.
- Dale Wiegel - Deputy Director, Development Department, International Finance Corporation. Called to discuss IFC research and studies on barriers and incentives to private investment in LDCs.

U.S. Private Sector

- Romir Chatterjee - President, International Development and Energy Associates, Inc. He has worked on many energy projects in AID-assisted countries. Called him to discuss barriers and country programs to promote private investment in energy conservation.

- Howard Geller - Associate Director, American Council for an Energy-Efficient Economy. He has worked extensively on end-use electricity efficiency in LDCs and recently completed a report for World Bank Energy Department on the potential for end-use electricity conservation in LDCs.

- Beth Kilmer - Research Associate, Business International Corporation. Called to request information and reports on private foreign investment in LDCs, especially the factors that firms evaluate before deciding to invest.

- Vinod Shrivastava - Vice President, International Operations, Engineering and Economics Research, Inc. He has worked extensively in industrial energy conservation in LDCs. Contacted him specifically to discuss Thailand.

- Peter Teagan - Arthur D. Little, Inc. He has worked extensively on energy and agriculture in developing countries.

- Peter Thomas - The Hay Group and consultant with Sears World Trade. He was a speaker at the USAID International Conference on Privatization. He specializes in privatization projects and has prepared a handbook on privatization and a bibliography of worldwide privatization literature.

Academia

- G. Anandalingham - Assistant Professor, Department of Systems Engineering, University of Virginia. He has written extensively on incentives and disincentives for industrial energy conservation in LDCs and the economics of energy conservation.

- Steven Sawyer - Assistant Professor, Department of Geography, University of Maryland. He has written extensively on energy conservation and recently completed a report on energy conservation legislation and regulations enacted in selected developing countries.

APPENDIX C: CHECKLIST OF BARRIERS TO FOREIGN INVESTMENT IN LDCS

In this appendix, the barriers to foreign investment in LDCs are organized according to the classification system presented in the Introduction and cross-referenced to the bibliography in Appendix A. All barriers in the checklist apply to host country conditions and policies. The notation in parentheses following each barrier identifies the appropriate references in the bibliography (e.g., a5 refers to item 5 in Part A of the bibliography). General and sector-specific barriers checklists are presented in Appendices D and E.

No energy conservation-specific foreign investment barriers were identified in the literature review.

Technical

- Poor infrastructure (a10,a38)
- Lack of skilled labor (a5,a10,a38)

Economic

- Inappropriate general economic policies (a5,a10,a18,a19,a21,a22,a23,a38)
  - unstable overall investment climate (a5,a21,a22,a23,a38)
  - poor international credit standing (a23)
- Small size of market (a5,a18,a19,a21,a22,a23,a38)
- Price controls (a8,a18)

Financial

- Faster payback required on investments in LDCs (a23)
- Lack of access to local capital (a8,a10,a18,a21,a22)

Institutional

- Political instability, risk and uncertainty (e.g., nationalization, expropriation, war) (a8,a10,a12,a18,a19,a23,a39)
- Government's general attitude toward foreign investment and free enterprise (a5,a8,a10,a12,a19,a23,a37,a38)
- Restrictions of Islamic Law (a33)
- Complex and bureaucratic arrangements and procedures - "red tape" (a5,a8,a10,a18,a21,a22,a37)
  - complex approval process (a8,a26)
  - complex entry system (a5,a21,a22,a38)
  - complex incentives system (a19,a21,a22,a38)
- Instability, uncertainty, inconsistency of decisionmaking process and policies (a5,a18,a21,a22,a38)
- Lack of cohesive development policy (a10,a19,a38)
- Discrimination against foreign investment (a19,a38)
- Foreign investment excluded from certain sectors/industries (a8,a21,a22,a38)
- Burdensome regulations/restrictions on organization, ownership, management (a8,a10,a19,a23)
  - restrictions on degree of foreign ownership/participation (a8,a10,a12,a18,a21,a22,a24,a37)
- Foreign exchange restrictions (a8,a18)
  - currency inconvertibility (a8,a10,a19,a24)
  - restrictions on repatriation of capital and profits (a8,a10,a12,a18,a19,a21,a22,a24,a33,a34)
  - licensing requirements to import and export goods (a8,a21,a22)
- Performance obligations/requirements (a8,a18,a21,a22,a26,a38)
  - employment restrictions (a8,a18,a24)

APPENDIX D: CHECKLIST OF BARRIERS TO PRIVATE INVESTMENT IN ENERGY CONSERVATION IN LDCS

In this appendix, the general barriers to private investment in energy conservation in LDCs are organized according to the classification system presented in the Introduction and cross-referenced to the bibliography in Appendix A. The notation in parentheses following each barrier identifies the appropriate references in the bibliography (e.g., a1 refers to item 1 in Part A of the bibliography, b3 refers to item 3 in Part B). These barriers apply to private investment in energy conservation in all sectors. Foreign investment and sector-specific barriers checklists are presented in Appendices C and E.

Technical Barriers

- Lack of awareness
  - of long-run energy problem (a44)
  - of energy conservation policies (a28)
  - of need and potential for energy conservation, available technology, and benefits and costs (a3,a6,a11,a20,a25,a28,a30,a33,a37,a41,a44,a45,a47,b1,b6,b7,b8,b9,b10,b11,b12,b13,b14,b17,c6,d6,e1,e3,e4,e5,e6,f2)
  - of impact of conservation on profits (a28,a44,a45)
- Lack of detailed and reliable energy data base at national, sector, and individual enterprise level (a31,a36,a37,a46,b6,b7,b10,b12,c1,c3,c4,d1,d2,d6,e1,e6,f1,f2,f3)
- Lack of skilled manpower: (a6,a20,a28,a31,a33,a36,a37,a42,a44,a45,a46,a47,b3,b6,b8,b9,b10,b11,b14,b15,b17,c3,c6,d1,d4,d5,d6,d7,d8,d10,e1,e4,e6,f4,f5,f6)
  - energy managers
  - energy auditors
  - energy planners
  - energy equipment suppliers

  - technicians
  - local consultants

- Lack of energy conservation technology, goods, and services (a6,a33,a44,a45,a47,b10,b14,d7,e6,f2,f3)
- Poor infrastructure (a32,a47)

Economic Barriers

- Low world oil prices
- Domestic price distortions (a3,a4,a14,a15,a20,a25,a27,a29,a30,a31,a32,a33,a35,a36,a37,a42,a44,a45, a46,a47,b1,b2,b3,b6,b7,b8,b9,b11,b14,b15,b17,c3,c5,c6,d1,d2,d3,d7,d8, d10,e1,e3,f1,f2,f4)
  - energy prices set below economic opportunity costs
  - distortions in relative prices of competing energy products
  - parastatals/monopolies distort energy prices and incentives
- Energy only one or small part of total costs (a6,a16,a25,b1,b7,b10,d3,d8)

Financing Barriers

- Lack of internal sources of capital (a16,a33,a17,b1,b3,b10,b13,b14,b15,b17,c1,d6,e1,f2)
  - competition for scarce capital between energy conservation investment opportunities and investments to maintain or expand market share and production (a16,a17,a33,a45,b4,b7,b10,b11,b14,b15,f2)
  - energy-efficient technologies and equipment often more costly than less efficient equipment (f1,f2)
  - private return less than social return due to taxes, different discount rates, shorter payback periods required by private sector (a2,a16,a40,a44,b11,f2)
  - managers evaluate investments on basis of minimum first cost rather than life-cycle cost (b8,f2)

- Lack of access to capital/financing on favorable terms (a2,a3,a17,a20,a25,a33,a35,a36,a44,a45,a47,b1,b2,b3,b7,b9,b10,b11,b14, b15,b17,c1,f2,f5)

- Lack of experience with conservation technologies (a2,a36,a47)

  - inability to evaluate energy conservation investments (by both lending institutions and private enterprise considering investment)(a40,b7,e5,e6)

  - lending institutions not aware of payoff from energy conservation investments (b10)

- Perception of high risk and uncertainty of recovering energy conservation investment (a16,a28,e3)

  - uncertainty of project performance (a2,a3,a11,a16,a17,a28,a47,b7,e3,f2)

  - lack of asset security (a2,a36)

  - high front-end cost just to evaluate technical and economic feasibility of energy conservation investments (a6,a17,a30,e3,e6,f2)

  - lack clear cash flow stream to create return on investment and to provide for debt repayment - lack visibility (a2,a36,a40,a44,b12)

  - general uncertainty over economic future (a11,e3)

- Aversion to assuming fixed repayment obligations of traditional loan because of uncertainty of energy conservation investments (a17).

Institutional Barriers

- Lack of government and management commitment and policy on energy conservation - energy conservation a low priority (a1,a3,a11,a33,b3,b9,b10.b11,b15,e1,e5,f4,f5)

- Weak and fragmented institutional structure for energy management and planning (a42,a47,b10,c1,c2,c5,c6,d1,d10,f2,f4,f5,f6)

  fragmentation of responsibility in government, among energy users and in the energy conservation supply industry (a10,a47,b10)

  - lack of institutions responsible for promoting conservation (a1,a6,a44,a45,f5)
  - poor implementation capacity (a1,a27)
  - lack of communication/coordination with private sector (a1,f4,f5)

- Public resistance - difficult to change attitudes and behavior (a30,d6,e1,e6)
  - Powerful special interest groups protect certain regulations/policies (a6,a11,a15,a29,d8)
- Energy conservation and required policies may conflict with other economic and social goals (a6)
- Unfavorable or inadequate regulations, restrictions and legislation
  - lack of standards for design and efficiency of energy-using equipment (a3,a6,a47,b10,d2,e1,e6)
  - restricted private sector access to foreign exchange to import equipment (a3,a20,a31,a35,b13)
  - public enterprises given priority access to capital and foreign exchange (a35,f2,f4,f6)
  - tariffs/import restrictions on energy efficiency equipment (a3,a30,a31,a32,a33,a36,a37,a44,a45,a47,c2,c6,d1,d2,f2)

APPENDIX E: CHECKLIST OF SECTOR-SPECIFIC BARRIERS TO PRIVATE INVESTMENT IN ENERGY CONSERVATION IN LDCS

In this appendix, the sector-specific barriers to private investment in energy conservation in LDCs are grouped according to the classification system presented in the Introduction and cross-referenced to the bibliography in Appendix A. The notation in parentheses following each barrier identifies the appropriate references in the bibliography (e.g., b1 refers to item 1 in Part B of the bibliography, d6 refers to item 6 in Part D). Foreign investment and general barriers checklists are presented in Appendices C and D.

INDUSTRY-SPECIFIC BARRIERS

Technical

- Insufficient data on energy use by enterprise, product, and energy source; fuel costs; production levels; and plant size (b6,b7,b10,b12)
- Lack of engineering, audit, and consulting manpower within and outside plants (a33,b3,b6,b8,b9,b10,b11,b14,b15,b17)

Economic

- Cost-plus price control system for manufactured products (a45,a47,b10,b14,f1)

Institutional

- Industrial managers hesitate to interrupt production flows (b10,b11,b14)
- Industrial managers reluctant to share information on production efficiency improvements with competitors (b13)
- Fuels often rationed and based on previous year's consumption (b3,b5)

AGRICULTURE-SPECIFIC BARRIERS

Technical

- Data on traditional energy consumption in agriculture sparse (c1,c3,c4)
- Insufficient data to estimate total agricultural energy use and where energy is consumed (c1,c4)
- Lack of data on comparative technical and economic performance of various irrigation pumping options (a33,c5,c6)

Economic

- Electricity tariffs and diesel fuel costs heavily subsidized (c5,c6,f2)

Institutional

- Lack of coordination between energy and agriculture institutions (a33,c1)
- Lack of energy planning in agriculture (c1,c2,c5,c6)

TRANSPORTATION-SPECIFIC BARRIERS

Technical

- Lack of data on energy use by different transport modes (d1,d2,d6)
- Lack of data on vehicle maintenance, driver behavior, and fuel efficiency (d6)
- Lack of information about availability of loads (d2)
- Lack of skilled mechanics and technicians (c3,d4,d5,d6,d7,d10)
- Lack of spare parts
- Drivers not trained to operate vehicles in energy efficient manner (a44,d1,d4,d5,d7,d8)

- Poor fuel quality (d6)
- Low scrapping rates of vehicle fleets (d2)

Economic

- High income elasticities and low price elasticities (d2,d7,d8)

Financial

- Energy efficient vehicles are generally more expensive and hence more difficult to finance

Institutional

- Lack of coordination of energy, transportation, and urban traffic planning (d1,d10)
- Multiplicity and variety of energy users (d6)
- Higher incomes stimulate demand for flexibility, convenience, and leisure-related transportation (a30,d2)
- Poor traffic management (a44,d10)
  - poor route selection (a44)
  - low load factors (d1,d8)
  - unsatisfactory bus service (d2)
  - inability to enforce traffic laws (d9,d10)
  - regulations on backhauling (c3,d2)

BUILDINGS-SPECIFIC BARRIERS

Technical

- Lack of data on energy consumption by type of energy, service, and building category (e1)

- Lack of engineers, architects, builders, technicians trained in energy-efficient design, construction, installation, and maintenance (a6,e1,e4,e6)

Institutional

- Large public housing sector
- Landlord/tenant conflict of interest (a6,e5)
  - If landlord pays utility bills, little incentive for tenant to conserve energy (a6,e5)
  - If tenant pays utility bills, little incentive for landlord to make energy conservation improvements (a6,e5)
- Diffuse/fragmented sector (e1,e4,e6)
- Lack of building codes (a47,e1,e6)
- Building codes and practices conflict with energy efficient design and operation (a6,a47,e1,e6)

ELECTRIC POWER-SPECIFIC BARRIERS

Large-scale, Government-owned Utilities

Technical

- No systematic assessment of system performance efficiency
- Lack of engineers (f6)

Institutional

- Sector dominated by public utilities/monopolies (a30,a31,f1,f6)
- Multiplicity of regulatory authorities and distribution agencies (f1,f6)
- Utilities focus on building new power plants rather than improving operation of old plants

Cogeneration and Small-scale Power Generation

Technical

- Utility and industrial managers unfamiliar with cogeneration and independent power options (f4)
- Lack of power experts outside of large, government-owned utilities (f5)
- Lack of suitable demonstration systems, equipment, and spare parts (a33)

Economic

- Low world energy prices favor large utilities over small-scale, private systems
- Because public utilities are subsidized, it is difficult for private power systems to compete

Financial

- High cost of power investments makes them difficult to finance (a33)
- No well-developed sources of long-term financing for investments in private power systems (f5)
- Public utilities have priority access to low-cost capital (f4)

Institutional

- No institution to coordinate private-sector power generation (f5)
- No policy for private investment in the power sector (f4,f5)a
- No framework for transactions with private-sector (f4,f5)
- Private parties doubt government's commitment to private-sector power generation (f4)
- Legislative restrictions and regulations (a33)

APPENDIX F: SURVEY ON POLICY BARRIERS TO PRIVATE INVESTMENT IN ENERGY CONSERVATION

The Office of Energy of USAID is conducting a study of the policy barriers (e.g., distorted prices, taxes, import and foreign exchange restrictions, burdensome regulations) to private-sector investment in energy conservation in AID-assisted countries. To make this study as complete as possible, the attached survey is being distributed to individuals working in AID-assisted countries for the purpose of gathering the most up-to-date information on government policies or practices that may inhibit or encourage investment in energy conservation.

The survey is divided into two parts:

- Part 1 attempts to determine what barriers exist in individual AID-assisted countries, both in general and by sector, and to quantify or rank the severity (on a scale of 0-5)
- Part 2 asks more detailed questions about certain barriers, possible incentives, and government and private sector perceptions.

Your cooperation in completing this survey will be greatly appreciated.

SURVEY ON BARRIERS TO PRIVATE INVESTMENT IN ENERGY CONSERVATION: PART 1

Please rank the severity of the barriers on a scale of 0 to 5 (0=barrier does not exist; 5=most severe)

COUNTRY:_____ DATE:_____ COMPLETED BY:_____

Barrier	Exists: Y/N/NA*	Severity (0-5): Overall	Industry	Agriculture	Transport	Buildings	Power
Technical							
Lack of awareness							
Lack of data							
Lack of skilled manpower							
Lack availability of conservation goods, services, technology							
Poor infrastructure							
Economic							
Low world oil prices							
Domestic price distortions							
subsidies							
cost-plus pricing							
Financial							
Lack of internal capital							
Lack access to capital on favorable terms							
Lack ability to evaluate investments							
Perception of risk and uncertainty							
Institutional							
Lack government commitment							
Lack conservation plan							

Exists:Y/N/NA Severity: Overall Ind. Ag. Trans. Bldgs. Power

Lack conservation planning agency

Lack coordination with private sector

Public resistance

Lack standards/codes

Restricted private access to capital

Restricted private access to foreign exchange

Public enterprises given priority access to capital & foreign exchange

Tariffs/import restrictions

*Not available/not known

SURVEY ON BARRIERS TO PRIVATE INVESTMENT IN ENERGY CONSERVATION: PART 2

COUNTRY:_____ DATE:_____ COMPLETED BY:_____

Energy Prices

1. Are energy prices subsidized? Please indicate (Y=yes N=No, NA=Not known) by sector (Ind=industry, Pow= power, Ag=agriculture, Comm=commercial, Trans=transport, Urb=urban households, Rur=rural households)

	Ind	Pow	Ag	Comm	Trans	Urb	Rur
a) Kerosene							
b) Diesel							
c) Electricity							
d) Heavy fuel oil							
e) Coal							
f) Other _____							

2. Please list the end-user price of the following energy products and indicate the units (e.g, gallon, ton, etc), local currency and U.S. dollar exchange rate:

a) Gasoline: Reg._____ Prem._____ No-lead_____

b) Kerosene_____

c) Diesel_____

d) Electricity_____

e) Heavy fuel oil_____

f) Coal_____

3. Do prices for the same product vary for different consumer groups? Yes___ No___ Not known___

a) If yes, please specify products, prices and consumer groups_____

4. If energy prices have been regulated in the past, has the government taken steps to move toward free market prices? Yes___ No___ Not known___

a) If yes, describe specific steps taken, including which fuels and which sectors have been affected

Financing Policies

1. Are public enterprises given preferential access to financing? Yes___ No___ Not known___

2. Please indicate the average interest rates charged to the private and public sectors for energy conservation-related loans_____

3. Please indicate the average payback period required of the private and public sectors for energy-conservation related loans_____

4. Are special financial incentives offered to private enterprises that invest in energy conservation? Yes___ No___ Not known___

	Yes	No	Not known
a) Subsidized-interest loans?			
b) Longer payback periods on loans?			
c) Tax credits?			

	Yes	No	Not known
d) Accelerated depreciation for energy efficiency equipment/ materials?			
e) Grants/no-risk loans?			
f) Loan guarantees?			
g) Other?			

Trade policies

1. Please specify tariff levels/import restrictions on energy efficiency equipment_____

2. Are any conservation-related imports specifically exempt from tariffs/import restrictions? Yes___ No___ Not known___

   a) Please specify_____

Foreign exchange policies

1. Are certain sectors/industries given priority access to foreign exchange? Yes___ No___ Not known___

   a) Please specify_____

Energy efficiency standards

1. Are there design and efficiency standards for energy-using equipment? Yes___ No___ Not known___

	Yes	No	Not known
a) For appliances?			
b) For buildings?			

	Yes	No	Not known
c) For motor vehicles?			
d) Other? Please specify_____			

Government policy on energy conservation

1. If there is a national energy conservation plan, are their specific conservation targets? Yes___ No___ Not known___

2. Is there an energy conservation center? Yes___ No___ Not known___

3. Is there a special energy conservation loan authority? Yes___ No___ Not known___

4. Is the government sympathetic to increasing the private sector's role in the economy in general and in energy conservation in particular? Yes___ No___ Not known___

5. How has the recent drop in world oil prices affected the government's attitude toward energy conservation

_____

_____

Additional Comments

1. Are there other government policies, regulations, practices not addressed above that are barriers to private sector investment in energy conservation? Yes___ No___ Not known___

a) Please specify_____

_____

_____

2. Are there other incentives offered by the government to encourage private investment in energy conservation? Yes___ No___ Not known___

a) Please specify_____

_____

_____

3. What do local private businessmen see as the primary policy barriers to investing in energy conservation?

	Yes	No	Not known
a) Distorted energy prices			
b) Lack of access to finance			
c) Lack of access to foreign exchange			
d) Import restrictions			
e) Lack of government commitment			
f) Energy conservation not a government priority			
g) Other _____			

4. What types of incentives do businessmen believe would be the most likely to encourage investment in energy conservation? _____

5. What do government officials see as the primary policy barriers to energy conservation?

	Yes	No	Not known
a) Distorted energy prices			
b) Lack of access to finance			
c) Lack of access to foreign exchange			
d) Import restrictions			
e) Lack of government commitment			
f) Energy conservation not a government priority			

g) Other _____

_____

_____

6. To the best of your knowledge, is the government considering offering any of the incentives mentioned by the private sector? Yes___ No___ Not known___

a) If yes, which ones? _____

_____

_____

Other Comments

Please use this space to write any additional comments you might have about barriers to private investment in energy conservation in this country (e.g., types of incentives that should be offered, suggested changes in government policies).

APPENDIX G: CONSERVATION NEED AND POTENTIAL

As a result of an analysis of the energy needs and energy conservation potential of AID-assisted countries, the Office of Energy has divided those countries into five target groups for energy conservation activities. They are:

- Very attractive (AID involvement in energy conservation should remain very high or should be increased substantially)

  Dominican Republic
  Ecuador
  Egypt
  India
  Indonesia
  Jamaica
  Morocco
  Pakistan
  Peru
  Philippines
  Thailand
  Turkey

- Attractive (large potential for conservation, but evaluations of existing programs are needed prior to additional AID activities)

  Costa Rica
  Djibouti
  El Salvador
  Guatemala
  Haiti
  Honduras
  Kenya
  Panama
  Senegal
  Sri Lanka
  Sudan
  Tunisia

- Potentially attractive (potential for conservation, but no current AID conservation activities)

Bangladesh
Burma
Malawi
Mauritania
Niger
Portugal
Togo
Zaire
Zambia

- Not attractive (very limited energy conservation potential)

Burundi
Botswana
Cape Verde
Gambia
Lesotho
Nepal
Rwanda
Seychelles
Uganda
Zimbabwe

- More information needed (analysis precluded by lack of data)

Belize
Burkina Faso
Cameroon
Central African Republic
Chad
Comoros
Congo
Cyprus
Equatorial Guinea
Chana
Grenada
Guinea
Jordan
Liberia
Madagascar
Mali
Mauritania
Sierra Leone
Somalia
Swaziland
Yemen

Source: Office of Energy, Bureau for Science and Technology, U.S. Agency for International Development. Strategy and Program Plan for Energy Conservation FY86 and FY87. October 1985.

APPENDIX H: PRIORITY COUNTRIES FOR USAID

(Ranked by Estimated Total Development Assistance and Economic Support Funds Received in FY 1986 - in US$ million)

Country	Rank	Dvl. Assist.	ESF	Total
Israel	1	0	1148.4	1148.4
Egypt	2	0	780	780
Pakistan	3	27.5	239.2	266.7
El Salvador	4	81.1	177	258.1
Philippines	5	23.8	119.6	143.4
Costa Rica	6	14	120.6	134.6
Turkey	7	0.8	119.6	120.4
Honduras	8	48.5	61.2	109.7
Sudan	9	28	59.8	87.8
Guatemala	10	38.2	47.8	86
Jamaica	11	21.2	59.3	80.5
Portugal	12	0	76.6	76.6
India	13	75	0	75
Bangladesh	13	75	0	75
Dominican Republic	14	26.8	40	66.8
Indonesia	15	52.4	0	52.4
Ecuador	16	26.4	20.1	46.5
Liberia	17	17.3	28.7	46
Kenya	18	25.1	14.4	39.5
Somalia	19	14.8	22	36.8
Zaire	20	25.3	9.6	34.9
Morocco	21	22.2	11.5	33.7
Senegal	22	20.4	11.5	31.9
Peru	23	21.9	9.6	31.5
Thailand	24	25.4	5	30.4
Bolivia	25	12.9	14.3	27.2
Haiti	26	23.3	2.9	26.2
Panama	27	17.2	5.7	22.9
Tunisia	28	1.8	19.1	20.9
Sri Lanka	29	20.1	0	20.1
Jordan	30	0	9.6	9.6

Source: U.S. Agency for International Development. Congressional Presentation Fiscal Year 1987, 1986.

APPENDIX I: PRIVATE SECTOR SHARE OF DOMESTIC CREDIT

Country	Private/Total Domestic Credit
Africa	
Botswana	(neg)
Burkina Faso	1.06
Burundi	0.36
Cameroon	1.09
Cape Verde	(n/a)
Central African Republic	0.65
Chad	0.75 (1983)
Comoros	(n/a)
Congo	0.82
Djibouti	(n/a)
Equatorial Guinea	(n/a)
Gambia	0.37
Ghana	0.12
Guinea	(n/a)
Guinea-Bissau	(n/a)
Kenya	0.61
Lesotho	0.48
Liberia	0.27
Madagascar	0.44
Malawi	0.38
Mali	0.61
Mauritania	0.76
Mauritius	0.37
Mozambique	(n/a)
Niger	0.81
Rwanda	0.75
Sao Tome	(n/a)
Senegal	0.72
Seychelles	0.38
Sierra Leone	0.10
Somalia	0.39
South Africa	0.88
Sudan	0.31
Swaziland	1.03
Togo	0.97
Uganda	0.35 (1983)
Zaire	0.20
Zambia	0.30
Zimbabwe	0.59

Asia/Near East

Afghanistan	0.17 (1982)
Bangladesh	0.48
Burma	0.09
Cyprus	0.83
Egypt	0.26
India	0.52
Indonesia	1.24
Israel	0.50
Jordan	0.73
Lebanon	0.70
Morocco	0.40
Nepal	0.31
Oman	2.58
Pakistan	0.56
Philippines	0.65
Poland	(n/a)
Portugal	0.58
Spain	0.66
Sri Lanka	0.59
Thailand	0.67
Tunisia	0.87
Turkey	0.55
Yemen	0.17

Latin America/Caribbean

Belize	0.56
Bolivia	0.31
Costa Rica	0.54 (1980)
Dominican Republic	0.43
Ecuador	0.93
El Salvador	0.54 (1983)
Fiji	0.79
Guatemala	0.54
Haiti	0.30 (1983)
Honduras	0.53
Jamaica	0.37
Panama	0.74
Peru	0.44
Uruguay	0.71 (1983)

Source: International Monetary Fund. International Financial Statistics, 1985 Yearbook. Statistics computed for most recent yearly data available - 1984 unless otherwise noted.