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IN-COUNTRY ENERGY STUDY

VOLUME I: OBJECTIVES AND STUDY APPROACH

Prepared for
The Agency for International Development (AID)

by

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PREFACE

Donovan, Hamester and Rattien, Inc. has prepared this questionnaire for the Office of Energy of the Agency for International Development (AID). It is designed to serve as a tool that will contribute to an improved understanding of developing nations' energy resources and needs in the context of future energy/economic development options.

The study consists of two volumes:

Volume I contains a statement of the study objectives, a description of the sequence in which the study will be conducted, and an outline for the final study report.

Volume II contains the Energy Study Questionnaire which will be employed in-country to obtain the information and data base necessary for the analysis in the final report.

Mr. Lawrence J. Ervin served as project supervisor, with Messrs. Robert Gordon, Kenneth Johnson, Gary Kah and Dr. Anil Cabraal assisting in question development and format design. Dr. Stephen Rattien provided project guidance and served as project reviewer.

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INTRODUCTION

Background

A nation's economic growth depends to a large degree on an adequate and assured supply of energy. Much of the rapid economic growth experienced by the developed countries is directly attributable to inexpensive, convenient and assured energy supply. A number of recent international energy studies, however, conclude that the economic development of developing countries will be severely inhibited by rising energy costs today and by shortages in essential fuels before the turn of the century.

Many developing countries are still striving to provide basic human needs for their people. They are faced with quite a different energy resource situation than that which prevailed during the period of development of the United States and other industrialized nations. For large-scale economic development to take place, industrial activity must grow and agricultural production must rise above the subsistence level. In many cases, the rising cost of imported fossil fuels jeopardizes this process. Most developing countries must meet the challenge of development in spite of rising energy costs and the consequent adverse changes fostered in their balance of trade and payments.

Increasing prices and growing scarcities of energy resources, especially oil--a preferred fuel for motive power, a modern agricultural requirement as a major ingredient in fertilizers and insecticides, and a primary fuel for industrial processes and electrical power generation--act as obstacles to the economic development efforts of the LDCs. Wood, the traditional fuel directly consumed by most people in the LDCs, is also becoming increasingly scarce.

The energy problems faced by developing countries also give rise to a number of problems affecting world economic stability. The growing interdependence of the developed and developing nations of the world is accentuated in the energy sphere. For example, a number of developing countries in the middle income range explosively increased their assumption of external debt following the 1973-1974 quadrupling of world oil prices. This increased reliance on short-term foreign borrowing raises serious questions about the future capability of these nations to service these larger debts.

Careful balancing of development plans with energy supply options can provide a cushion against the most severe effects of the difficult energy futures LDCs will face. Fortunately, many developing countries have a degree of flexibility in their energy planning not available to developed countries because they are not tied to an existing and expensive energy supply system or energy-using infrastructure. A number of strategies exist for developing countries to improve their energy situations. They can:

- initiate programs to explore for and develop indigenous energy resources;
- plan capital investment in energy using systems and technologies that will conserve imported fuels;
- plan their economic development to utilize indigenous energy resources or to maximize economic output per unit of energy consumed;
- develop alternatives to centralized energy supply, such as solar, wind, low-head hydro, biogas, etc.

Except for very underdeveloped countries, the energy sector of a nation's economy is almost invariably capital intensive and evolves over a long period of time. Thus, prudent energy planning over the next few years can have a significant impact on the long-range outcome of the economic development of a country.

An essential element of wise energy planning is the projection of future energy needs in the context of development goals. This requires a comprehensive information and data base covering all aspects of the energy economy. First, it must describe the central energy supply system (e.g., urban and rural electrification) and indigenous and imported fuel resources. Second, the information base must portray end-use characteristics in the residential, industrial, commercial, transportation and agricultural sectors in both rural and urban settings. And finally it must identify trends in lifestyle, urbanization, consumption, industrialization and economic growth that will require even greater energy resources in the future. An issue of critical concern is the effect of the introduction of new technology on social, cultural, political institutions and traditions.

Prior to the 1973 oil embargo, fuel cost and availability was only a minor consideration in most countries' development plans. Few countries maintained detailed energy supply information; in-depth end-use data were generally unavailable. According to the studies cited above, even today energy-related information and data for most developing countries are either insufficient in detail or in severe disarray for future planning and policy decisions.

Program Objectives

A program to survey the energy systems of a number of developing countries will be a first step in filling this void. The program's primary objective is to collect the basic information which is critical for a nation to rationally plan the development of its energy system. This data will enable a country to make economic and energy development decisions in a rational manner leading to:

- the choice of new energy supply sources based on future need, costs and availability;
- an assessment of import requirements, potential fuel shortfalls and strains on the balance of payments;
- identification of the possibilities for substitution of indigenous and renewable energy resources for imported resources;
- assessment of manpower requirements so that appropriate progress can be planned and enacted.
- the development of a strategy for financing energy supply projects in time to meet growing needs.

Survey Focus

A comprehensive energy survey involves a study of the present status and future trends of the energy economy. This encompasses the economic activity associated with the production of various forms of primary energy (both commercial and non-commercial), their transformation into secondary forms of energy (e.g., electricity), international trade in various forms of primary or secondary energy, the energy distribution system and end-use patterns of consumers. The comprehensive energy survey will be structured to provide data and information on the following aspects of the energy economy:

- past trends and present status of energy use by fuel form
- trends in the growth of the overall economy as an indicator of energy consumption growth;
- present status and future goals of the government and energy supply industries;
- program directions and capital requirements for developing energy resources to meet future needs;
- analysis of final consumption of energy by consumers;
- expected growth of future demands for various forms of energy;
- resources of various forms of primary energy available to meet future demands and estimates of costs of their development; and
- problems of future energy supply.

II. Study Approach

Study Sequence

The five steps listed below describe the order of events that comprise this study. Each step is an integral and required part in completing the survey.

1. Study Workshops - A brief workshop will be held after contractors have been identified in order to elaborate on the study purpose and the study approach, and to explain the mechanics of employing the questionnaire. The workshop will also include a discussion of the questionnaire's relationship to the final report, and an explanation and discussion of the contents and preparation of the final report. Workshops may include a short case study.

These workshops will be attended by the contractor's study teams which will consist of four or five individuals, including a team leader with in-depth experience in program management in developing countries. The leader will provide overall team supervision and guidance and coordinate activities with in-country agencies and organizations. The team will also consist of one or two technical experts with knowledge of national energy systems and energy technologies. In addition, two researchers who are familiar with the interview process will be assigned to each team. These teams will be responsible for preparing background country profiles, conducting country surveys, assisting in the analysis of data and preparing final reports. These tasks are discussed in greater length below.

2. **Prepare Background Country Profile** - This step is designed to fully prepare the survey team with an understanding of the specific country they will visit, familiarize the team members with the kind of information they will have to seek out in-country, facilitate the interview program and introduce the team to a first run-through of the final study report. During this step, the survey team will develop a brief, composite profile of a country to familiarize itself with the demographic characteristics and energy environment of the assigned country. This can be developed by using resources available in Washington, D.C. and New York at the World Bank, AID, the U.N., embassies and the country desks of other donor agencies. In addition, the questionnaire will be answered as fully as possible ahead of time to decrease the burden in-country.

In order to ensure accuracy, data collected in the U.S. during this step will be assigned a numerical accuracy grade of A (high), B, C, (low). As the accuracy of these data is confirmed in-country its grade will be adjusted accordingly. This same grading technique will be used for data collected in-country.

3. **In-Country Questionnaire Use** - The collection of basic data is an involved and time-consuming process and, in many instances, it requires the adoption of indirect methods and estimation; this is a difficulty experienced even by some of the developed countries. While statistics regarding commercial energy use

are generally available in the LDCs, they are often not in the desired detail, and collection of statistics on non-commercial energy will present considerable difficulty. In the energy studies of developed nations, non-commercial energy is omitted from consideration as it forms only a minor part of the total energy supply. In developing nations, however, non-commercial energy plays an important role, especially in the rural sector, and its contribution to the total energy economy cannot be ignored. Since few statistics of any sort regarding its use is generally available, indirect methods of estimation will have to be used.

In order to make the data collection less difficult, while providing constructive guidelines and a comprehensive overview, the Energy Study Questionnaire (Volume II) was developed. The Questionnaire is designed to elicit both direct and indirect information about energy use. It stresses the non-commercial energy sector while fully covering the commercial sector.

The study teams will conduct surveys in each country selected, supported by a local government, university or private research organization wherever possible. The availability of these local research organizations will determine actual team size. In addition to the obvious advantages of involving local researchers, the survey can serve as a vehicle for introducing a new subject area and increasing local research

capabilities. It is expected that each survey will require two-to-three weeks of in-country organization, interviewing and data research.

Because of the limited time and resources available for conducting the surveys, the first priority will be to collect basic information and data. The teams will interview the important agencies, banks, industrial and commercial associations, and other key organizations necessary to gather the necessary information. In addition, the researchers are to examine and collect reports and other original sources that are important to the study. With a full interview schedule (where possible, appointments will be arranged through AID in-country cooperation and through advance letters of introduction) study teams are expected to interview personnel in 10-20 agencies and organizations.

The teams may be divided into two groups: one will be responsible for the collection of basic data at pertinent agencies, organizations and projects, plus examining and collecting reports and other original sources that are important to the study; the other will be responsible for conducting interviews with public officials and private sector personnel who have organizational and program responsibilities.

In order to keep the interview conversational without losing the opportunities for qualitative input, most questions will allow for short explanatory notes along with a quantitative answer. Each surveyor will be required to maintain a daily log which will be used to express the feelings, intuitions and other information garnered in the interviews.

In addition, written or other non-verbal sources can be inventoried and indexed for subsequent recall. Evenings and weekends may be reserved for organizing data and preparing daily logs.

4. Initial Report - Upon returning to the U.S., each study team leader will present a written questionnaire and log and a verbal report to the AID Office of Energy. During this session the team leader will describe the team's findings, impressions and tentative recommendations for each country visited. This session will also serve to raise questions that may become considerations in preparing the final report.
5. Policy Analytical Final Study Report - The final step and product of the in-country survey will be a report suitable for guiding policy decisions of the host country. The report will be supported by appended data in tabular form. The questionnaire, therefore, has been developed to obtain information necessary for these reports and tables.

Each study report will consist of 10-15 narrative pages. While overall size will be determined by the complexity of a nation's economy and energy demand/supply situation, the principal section will focus on the various aspects of the role of energy in that nation's future. In order to assist in preparing the final report, guidance is provided on the following pages in the form of a) a preliminary final study

report outline, b) some considerations to be employed in preparing Section VI of the report and c) an Appendix containing the summary tables which will become Section VII of the report.

FINAL STUDY REPORT OUTLINE

- I. Historical Setting and Social Change**
- II. Geography and Population**
 - a. major geographic areas and water availabilities
 - b. climate
 - c. vegetation
 - d. minerals other than energy
 - e. settlement patterns and trends
 - f. population and trends
- III. Character and Structure of Economy**
 - a. patterns of growth and resource allocation
 - b. foreign participation in economy
 - c. labor
 - d. development plans
- IV. Energy Resources**
 - a. indigenous commercial
 - b. non-commercial
 - c. imported
 - d. renewable
- V. Energy Use by Sector**
 - a. Agriculture
 - 1. historical trends--traditional patterns
 - 2. crops
 - 3. improvement program
 - b. Manufacturing and Industry
 - 1. historical trends--traditional
 - 2. mining capabilities and major products
 - 3. electric power
 - c. Trade and Transportation
 - 1. trends in domestic transportation
 - 2. tourism
 - 3. communication
 - d. Residential and Commercial
 - 1. end uses
 - 2. trends
 - e. Rural/Urban Comparisons and Trends

VI. Overview of Energy Role in the Future Economy

- a. consumption patterns and trends**
- b. resource availability**
- c. potential for new alternative technologies and increased use of renewable energy resources.**

VII. Summary Tables for Energy Development

VIII. Data Sources

- a. agencies list**
- b. associations list**
- c. publication list**
- d. banks**
- e. manufacturers**
- f. AID (in-country)**
- g. international agencies**
- h. embassies**

Considerations for Preparation of Final Report

The key section of the final report for policy decision making for energy development is Section VI, "Overview of Energy Role in the Future Economy." In this section the information and data is integrated and analyzed. Areas of opportunity and directions for new programs are laid out in this section. The questions below should serve as a guide for the preparation of Section VI and should also provide a focus for the entire survey. These are fairly broad-based questions and should be answered on the basis of the study team's general perceptions as well as on the information collected.

- 1. What patterns (trends) of energy use are developing in the various sectors that indicate an increasing demand for commercial fuels? This should include increases in commercial energy requirements as a result of general economic development, population increases, increased**

- quality of life, urbanization and settlement in new regions.
2. Given the above trends, what is the potential likelihood of petroleum and firewood shortages in the medium and long-term?
 3. What are the short and long-term prospects for balancing energy demand with domestic resources?
 - a) What resources are available and what are the economics of their development?
 - b) What are the possibilities of continued import of various forms of energy and what are the economic impacts of this practice?
 - c) What is the potential for energy substitutions and conservation, and what will be the economic and social consequences?
 4. What technological changes can be made that achieve increased efficiency and economy in energy supply and consumption, yet are consistent with social realities?
 5. What is the potential for development of renewable energy resources (e.g., solar, low-head hydro, wind, biomass) to displace petroleum?
 6. What is the potential of renewable energy resources as a vehicle to increased development, improvement of the quality of life and providing new methods of doing work?
 7. What are the necessary policy decision and administrative actions that must be taken to develop and implement an effective energy policy (for example, legislative

action, tax and pricing policy, technical and management training, organizational changes and program and project development)?

8. What forms of assistance are available to the country in the above effort?

APPENDIX

Summary Tables for Energy Development

Summary Tables for Energy Development

The summary tables are intended to give a concise overview of "hard" energy-use patterns in the nation's economy and will comprise Section VII of the final report. They are to be completed by aggregating the information gathered through the package of energy-use questionnaires. It should be noted that much of the information required for planning energy assistance programs (such as the rationale for future growth projections and the potential for inexhaustible energy use) must be derived from the detailed questionnaire answers, not these summary tables.

Tables included in this section are:

1. Aggregate Energy Use
2. Agriculture
3. Manufacturing/Industry
4. Transportation
5. Residential
6. Commercial
7. Rural/Urban Trends

Each table includes statistics for two representative years: 1970 (pre-OPEC oil price increases) and 1977 (or the latest year for which information is available). The tables also include projections for 1985 energy use, which are derived from U.N. and host government projections as well as team member insights and questionnaire analysis.

Units for energy consumption are presented in SI (systems internationale, or metric) units. Energy consumption units gathered through questionnaires should be converted to SI units by the following conversion rules:

	<u>Megajoules (MJ)</u>
1 million Btu	1054 MJ
1 kilowatt-hour	3.6 MJ
1 barrel oil	6120 MJ
1 cf natural gas	1.50 MJ
1 ton (2000 lb.) coal (at 25 MBtu/ton)	26,350 MJ
1 ton (2000 lb.) firewood (50% moisture, at 10 MBtu/ton)	10,540 MJ

Electricity demand is expressed in kilo-watt hours (kwh), although fuel inputs for electricity generation are expressed in megajoules (MJ). Conversions for coal and firewood are average values - more precise conversions should be used if the fuel's caloric value is known. Methods for converting human and labor "energy consumption" to standard units should be explained in each case. In some countries, it may be desirable to give a qualitative description of "traditional" energy use instead of a few statistics (for example: 90% of the rice crop is transported by bullock carts to market. This represents ___ tons of rice being moved an average of ___ kilometers from farm to market. If this was converted to commercial trucking, about ___ gallons of gasoline would be consumed annually, assuming a vehicle efficiency of kilometers per liter).

SUMMARY TABLE 1

Aggregate Energy Use - 1977

Sector	Petroleum	Gas	Coal	Firewood	Bagasse	Charcoal	Other	Electricity	Total*
Agriculture									
Residential/ Commercial									
Industry									
Transportation									
Electric Utility									
Total									

Historical Energy Consumption

Fuel	1970	1977	Projected 1985
Petrol.			
Gas			
Coal			
Firewood			
Other:			

Sector	1970	1977	Projected 1985
Agriculture			
Residential/ Commercial			
Industry			
Transportation			
Total*			

*Includes primary fuel input to electricity generation

SUMMARY TABLE 2b
AGRICULTURE

CROP	YEAR	ENERGY CONSUMPTION									TOTAL ENERGY USE		
		STORAGE ^{3/}			TRANSPORTATION ^{4/}		PROCESSING ^{5/}			PETRO	ELEC	TRAD / OTHER	
		PETRO	ELEC	TRAD	PETRO	TRAD	PETRO	ELEC	OTHER				
1.	1970												
	1977												
	1985												
2.	1970												
	1977												
	1985												
3.	1970												
	1977												
	1985												
Other	1970												
	1977												
	1985												
Total Agricul- ture	1970												
	1977												
	1985												

3/ Includes temperature and humidity control.

4/ Includes transportation of agricultural inputs and crops to market or for export.

5/ Includes drying, canning, and marketing.

SUMMARY TABLE 4
Transportation

Mode	Number of Vehicles			Fuel Consumption Per Distance Units:			Average Annual Travel Units:			Annual Fuel Consumption		
	1970	1977	1985 ^{a/}	1970	1977	1985 ^{b/}	1970	1977	1985 ^{c/}	1970	1977	1985 ^{d/}
Auto												
Motor-cycle												
Truck												
Bus												
Train												
Airplane												
Boat and Ship												
TOTAL FUEL CONSUMPTION												

^{a/} Projection based on past trends, government projections and policies and anticipated growth in consumer income.

^{b/} Projection based on anticipated fuel efficiency trends through 1985.

^{c/} Projection based on government predictions, anticipated fuel prices, planned highway construction and forecasts of consumer demand for commercial transportation.

^{d/} Anticipated annual fuel consumption based on assumed data.

Summary Table 5
Residential

End Use	Fuel	Population Use Factor ^{1/}			Average Individual Use			Total Consumption		
		1970	1977	1985	1970	1977	1985	1970	1977	1985
Cooking	Wood									
	Kerosene									
	Electric									
	Gas/LPG									
	Other									
Hot Water	Wood									
	Kerosene									
	Electric									
	Gas/LPG									
	Other									
Lighting	Wood									
	Kerosene									
	Electric									
Heating/ Cooling	Wood									
	Kerosene									
	Electric									
	Solar									
	Other									
Other Appliances and Uses	Kerosene									
	Electric									
	Gas/LPG									
	Wood									
	Other									

1/ Fraction of population employing each fuel for a specified end-use

Summary Table 6

Country _____

Commercial

Sector	Year	Number of Buildings	Annual Energy Use					
			Electricity	Kerosene	Fuel Oil	Gas/LPG	Wood/Char.	Other
Hotels	1970 1977 1985							
Small Retail -Urban	1970 1977 1985							
Small Retail -Rural	1970 1977 1985							
Large Retail	1970 1977 1985							
Commercial Offices	1970 1977 1985							
Government (Schools etc.)	1970 1977 1985							

Rural/Urban Energy Use Trends

-26-

	1960	1970	1977	1985
Population: Rural				
Urban				
Per Capita Energy Use				
Rural: household				
agriculture				
transportation				
Urban: household				
transportation				
Total Energy Use				
Rural: household				
agriculture				
transportation				
Urban: household				
transportation				

Table 8 - Commercial Energy Price Indices

COUNTRY: _____

Price Controls?: _____

1977
Recent Data (Units)

1974
Data

1972
Data

ENERGY RESOURCE

Coal

Crude Petroleum

L.P.G.

L.N.G.

Aviation Gasoline

Motor Gasoline

Jet Fuel

Kerosene

Diesel Fuel

Fuel Oil

Natural Gas

Electricity

-R/C -Rural/Urban

-Industrial

Traditional Fuels

Charcoal

Firewood

Dung

COUNTRY: _____

TABLE 9

IMPORTED/EXPORTED ENERGY RESOURCES

(Negative sign indicates export)

<u>RESOURCE</u>	<u>197</u> <u>Recent Annual</u> <u>Usage (Units)</u>	<u>Cost¹/</u>	<u>1974</u> <u>Annual Usage</u>	<u>Cost¹/</u>	<u>1972</u> <u>Annual Usage</u>	<u>Cost¹/</u>
Coal						
Uranium						
Other Solids						
Crude Petro- leum						
L.N.G.						
L.P.G.						
Aviation Gasoline						
Motor Gasoline						
Jet Fuel						
Kerosene						
Diesel Oil						
Fuel Oil						
Natural Gas						
Electricity						
Non-Energy Products						
Other:						

1/Cost figures as for 197_ dollars.

TABLE 10

DOMESTIC ENERGY RESOURCES

<u>RESOURCE</u>	<u>ESTIMATED RESERVES</u>	<u>Domestic Production (or Conversion)</u>			
		<u>1960</u>	<u>1970</u>	<u>1977</u>	<u>1985</u>
Crude Petroleum					
Natural Gas					
Lignite					
Geothermal					
Hydro					
Uranium					
Biomass					
Wind					
Solar					

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IN-COUNTRY ENERGY STUDY

VOLUME II: QUESTIONNAIRE

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ENERGY STUDY

QUESTIONNAIRE

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I. Instructions

The use of consistent interview procedures by the in-country survey team is an important and necessary component of the information collection and Questionnaire completion process. Some interviews may be limited by time or other constraints, yet they must be sufficiently informative to enable the survey team to prepare a concise and comprehensive county report. The following instructions for conducting the interviews are designed to be straightforward, comprehensible, and generally applicable by all team members in a variety of situations.

1. Wherever possible, interviewees should be notified of the team's intention to visit a specific country. It is anticipated that most interviews will have to be arranged by the survey team upon arrival in country. The team leader should approve all visits, whether they are for interviews or purely for data collection.
2. Familiarize yourself thoroughly with the tone and content of that section of the questionnaire about to be discussed. This may require a lengthy review the night before an interview. This will enable you to cover the questions in a natural sequence.
3. Attempt to keep the interviews conversational using the formal questionnaire as a guideline. The questionnaire has been designed to be applicable in many varying countries, therefore, it is important to be creative when using the specific questions. Follow a

relevant train of thought even though it breaks the questionnaire pattern. Take careful notes, especially with respect to economic growth trends and increased use of commercial fuels for traditional ones.

4. Try to get quantitative measures of the important variables (e.g., number of employees, quantity of output, etc.). However, do not press the interviewee. It is usually better to have a solid qualitative answer than a bad quantitative one.
5. Keep a good record of the units of measurement (e.g., joules of energy, cords of wood, metric tonnes). Use units that are locally employed and familiar to the interviewee. Do not attempt to convert to standard units during an interview. The units given in the questionnaire are suggested only. Note any changes.
6. Keep a record of any reference material named by the interviewee. Attempt to get copies of useful data, documents, or reports where possible.
7. In some instances, for example different industries and agricultural crops, it will be necessary to repeat questions and data collection in order to provide specific information.
8. Grade the information on a scale of A (high quality), B, C (poor quality). This is a subjective procedure. The criteria for quality are difficult to describe. They include, but are not limited to:

- the age and completeness of quantitative data
- the degree to which information takes regional variations into account
- limitations on the interviewees knowledge and perspective

9. Request follow-up correspondence from any contact who may be able to provide further or refined information in the future. The questionnaire should also be as a checklist to make certain all the relevant questions are asked. If the interviewee is unable to provide particular answers, ask interviewee for names, addresses and/or telephone numbers of persons who could provide the missing information.

The interviewee should review notes on the same day as the interview to make sure that all the information has been collected. Transcribing notes onto new questionnaire forms may be necessary in some instances.

10. Where a general description of a sector is called for, provide a short essay to describe your observations of present status and trends (from personal perceptions and in the interview process) of the sector. Focus on energy related factors (e.g., "the commercial sector of country X is dominated by small shops and open air markets. Electricity is used sparingly for lighting at night; kerosene and wood are used for

cooking. The trend in large cities is toward larger
arcades and well-lit public areas. . .").

II. Geography and Population

The purpose of this section is to identify and describe ,population trends, geography, topography and indigenous mineral resources which influence economic development and growth in energy consumption. These are among the most important indirect indicators of growth in energy demand. For example, knowing the extent of the resource base and the development plans for the resource provides an indication of future resource availability, which can be used to project future energy demands.

I. Geography

1. (a) How large is the country? _____sq. miles.
(b) Describe its major geographic regions including regional topography.

2. Describe the climate:
 - (a) What are the major seasonal variations that affect agriculture, transportation, heating?

 - (b) What are the seasonal temperature and rainfall averages and ranges?

3. Describe the available water resources: underground, surface, riverine, coastal.
4. (a) What is the extent of forestland? _____ sq. kms (miles).
- (b) What is the rate of deforestation? _____ in sq. kms (miles)/year.
- (c) What kind of forests predominate?
- _____rainforest
- _____deciduous
- _____hard wood
- (d) Describe any reforestation plans.
5. Is there a plan for using the forest as an energy crop? (e.g., biomass and firewood)
6. (a) What are the country's non-energy major mineral resources?
- (b) What is the annual commercial value of production?

		<u>\$</u>	<u>Tons</u>
	1965	_____	_____
	1975	_____	_____
Projected	1985	_____	_____

(c) What are the development goals for known reserves of commercial minerals?

(d) Who owns the means of production?

7. What countries, commercial enterprises, or government agencies have major plans in the development of domestic non-energy resources?

II. Population

1. (a) What is the current population? _____ The growth rate in the last 5 years _____ %/year.

Projected population: 1985 _____
1990 _____
2000 _____

(b) What percent of population is rural _____,
urban _____?

Urban

Rural

1965
1977
Projected 1985

(c) Describe the regional distribution of the population.

2. (a) What is the rate of growth of the urban areas?

(b) What part of this is attributable to urban migration?

3. Describe the current and projected age groups as fractions of the population:

	1965	1975	Projected 1985
< 15 years	_____	_____	_____
15-35	_____	_____	_____
35-45	_____	_____	_____
45 >	_____	_____	_____
	100%	100%	100%

III. Economic Overview

Energy demand is closely tied to a nation's level of economic activity, and future energy demand forecasts must be based on projected economic activity. This requires an understanding of its current economic activity, the organization of businesses, role of foreign and multi-national corporations, government ownership or regulation of business and future development goals. The overview section is meant to establish the basic economic markers (GNP, per capita income, etc.) but also should describe the organization of business and commerce in the nation, especially the important differences found between this country and Western nations.

1. (a) What is current Gross National Product (GNP)? _____
- (b) Current Gross Domestic Product (GDP)? _____
- (c) Current per capita income? _____
- (d) What is projected growth rate:

	GNP	Per Capita Income
1985		
2000		

2. How much of the population is outside the nation's "money economy"? Describe the extent to which this portion of the population produces its own food, clothing, shelter, and fuel; in what regions are they found, what "cash crops" or goods are sold for money, and what are the primary purchased products (fule, food, manufactured goods, etc.).

3. How important is barter in rural and urban commerce?

4. What other forms of non-monetary compensation are prevalent?

5. (a) What is the current balance-of-payments?

(b) What is the balance-of-payments trend?

(c) What role does import/export of energy sources play in balance-of-payments?

6. What are the major imports and exports? Are there major changes expected in particular commodities?

7. (a) How did the 1974 oil price increase affect the balance-of-payments?

(b) Is future energy availability perceived to be a major problem?

8. What has been employment rate of working age population? What is current employment situation in rural and urban areas?

9. What is literacy rate? Describe literacy program.

10. What percentage of national budget is targeted for development efforts?

11. What role does foreign participation (capital/management) play in the economy?

12. What is the role of the foreign assistance in the economy?

13. Describe the ownership (private, public) of the means of production, transportation, natural resources, etc. in the economy.

14. What plans have been made to assure economic growth in the light of high costs and potential energy shortages (particularly oil and natural gas) in the future?

IV. Energy Resources - Commercial and Traditional

Economic and social development are increasingly determined by the availability, extent, and location of indigenous energy, resources, both mineral and renewable, and the costs of their development. A knowledge of resource availabilities will influence the relative role that each resource plays in meeting future needs and in the development of a general energy policy. This is particularly so in nations in which limited foreign exchange restricts imports and scarce capital limits resource development.

A. Oil and Natural Gas

1. Are the oil and gas industries owned privately by the government, jointly or otherwise?

2. (a) In what regions of the country are there substantial commercial quality oil and gas reserves?

(b) How extensive are the oil and gas reserves (in estimated barrels, tons, cubic feet)?

<u>Known</u>	<u>Probable</u>	<u>Possible</u>
--------------	-----------------	-----------------

(c) How much exploration is being conducted?

3. How much does it cost to produce a new barrel of oil?

4. (a) What have the past and current production levels been?

(barrels and sales)

	<u>Annual Output</u>			
	<u>Barrels of Oil</u>	<u>Sales</u>	<u>Cubic Ft. Gas</u>	<u>Sales</u>
1965				
1977				
Projected 1985				

(b) How much of the 1977 oil and gas production was exported?

	<u>Quantity Exported</u>	<u>Foreign Revenue Earnings</u>
Oil		
Gas		

5. (a) Are there oil refineries in the country?

(b) How much domestic oil is refined domestically?

(c) How much imported oil is refined domestically?

(d) What are the end products of refining of oil?

	<u>Quantity</u>	<u>Sales</u>
Kerosene		
Gasoline		
Diesel		
Distillate		
Jet Fuel		

(e) Is petroleum used for commercial feedstocks? In what quantity? For what use?

6. (a) How much crude oil is imported? What trends are projected?

	<u>Barrels</u>	<u>\$</u>
--	----------------	-----------

	1965	
	1977	
Projected	1985	

(b) How many gallons of each of the following petroleum products are imported per year? Trends? Projected

	<u>1973</u>	<u>1977</u>	<u>198-</u>
--	-------------	-------------	-------------

- Kerosene
- Gasoline
- Distillate
- Residual
- Diesel
- Jet Fuel

7. From whom are the oil, gas and petroleum products purchased?

8. What are the national plans and goals for the exploration and development of indigenous oil and gas resources?

9. Are there any major national, international or commercial programs aimed at locating or developing oil and gas resources? Who are the sponsors? How much capital expenditure is projected for projects?

10. How are oil and gas transported?

Oil

Gas--How extensive are pipelines? What is LNG potential?

11. (a) What fraction of the total national cost of imports is for oil?
 (b) for gas?

	<u>OIL</u>	<u>GAS</u>
	1965	
	1977	
Projected	1985	

B. Hydro-Electric Power

1. What is the total existing electricity generating capacity from hydro-power (in KW)? What is the distribution by size of facilities?

2. What has been the rate of growth of hydro-power capacity?

	<u>KW</u>
	1965
	1977
Projected	1985

3. What are the estimated untapped hydro-power resources? (estimates based on (a) theoretical, (b) technical, and (c) economic considerations)

4. (a) In what regions are the developed resources located?

- (b) In what regions are the major potential resources located?
 - (c) How far are they from major population centers?
- 5. (a) What are the existing plans for development of hydro resources in the future?
 - (b) What organizations are planning this development?
 - (c) What is the expected capital investment?
- 6. What is the cost of hydro electricity?
- 7. (a) Have "low-head" hydro resources for electricity generation been considered for development? How extensive is the potential from small-scale hydro resources? Are there plans for developing these resources?

C. Firewood

1. Approximately how much firewood is supplied annually?

1965

1977

Projected 1985

2. In what proportions do the following sectors use the firewood?

	<u>8</u>
residential/commercial	
industrial	
utility	
agriculture	_____
	100%

3. How much firewood is available annually from existing forest resources?

4. (a) Has over-harvesting of firewood created a problem?

(b) If so, describe its extent.

5. Has the country forested land area decreased over time?

	<u>Acres (hectares)</u>	<u>% of Total Land</u>
1960		
1977		
Projected 1985		

6. (a) Are there any plans (national) to cultivate trees in selected areas for the purpose of providing firewood?

(b) how much and when will firewood be available from these planned forests?

(c) Which agencies are sponsoring this effort?

(d) Which kind of trees will be cultivated?

(e) What is the cost of these programs?

D. Charcoal

1. Is charcoal used extensively as a fuel? ___ Yes ___ No

If so, who are the major users?

<u>Rural</u>	<u>Urban</u>	
_____	_____	Residential
_____	_____	Commercial
_____	_____	Manufacturing
_____	<u>N/A</u>	Agriculture

2. How much is consumed annually by rural and urban users?

_____ Rural
 _____ Urban

3. What percentage is produced for self-consumption (principally by rural residential/agricultural/industrial users) and how much is produced for commercial sale?

	Quantity Produced Annually (tonnes)		<u>Commercial Cost</u>
	<u>Self-Consumption</u>	<u>Commercial</u>	
1965			
1977			
Projected 1985			

4. Is commercial charcoal production increasing? Are new areas being opened up for charcoal production? Has this been planned or is it the result of other events such as new road construction or increased urban demand?

5. How much wood is required per pound of charcoal production?

2. Bagasse

1. Is bagasse a significant fuel?
2. (a) In what way is bagasse used?

(b) What technologies are used to convert bagasse to useful energy?

(c) By what sector?

Agriculture
Utility
Industry
Residential

3. How much bagasse energy is produced?

_____ \$ SALES
1965
1977
Projected 1985

4. Is the sugar industry expected to grow in such a way as to increase bagasse production?

F. Coal

1. Is coal being produced in the country?
2. What is the gross output by year in tons?

TONS \$ SALES
1965
1977

3. How extensive are the national deposits of coal estimated to be (in tons)? Known Probable Possible

4. In what regions of the country do deposits of commercial quality (and size) coal lie?

5. (a) What is the average heating value per pound of coal?
(or equivalent metric measure)
- (b) What is the rank of the coal (anthracite, bituminous, sub-bituminous, lignite)?
6. (a) What is the commercial price of coal?
Price
1978
1975
1960
7. (a) What are the major uses of coal?
- (b) How has this changed over time?

G. Coke

Metallurgical (for the iron and steel industry) and Non-Metallurgical
Coke

1. (a) Is metallurgical coke produced domestically?
- (b) How much coal is converted into coke?
- (c) What have been the trends in coke production?
Tons \$ Sales
1965
1977
Projected 1985
2. Where are major coke industrial centers located?

3. Is the industry owned privately, by the government, jointly or otherwise?

4. What is the current price of coke?

5. (a) Is coke exported or imported?

(b) To or from whom?

(c) How much?

	<u>Tons</u>	<u>\$ Sales</u>	<u>Imported or Exported</u>
1965			
1977			
Projected 1985			

6. Are there government policies or legislation that govern coke production, import or export (e.g., taxes)?

7. (a) How much coal is imported? (in tons and dollar value)

(b) From whom is it purchased?

8. (a) Are there any national plans and goals for the exploration or development of coal? What are they? Will outside assistance be provided or requested?

9. Is coal viewed in national development plans as an essential fuel?

critical _____

useful _____

minor _____

H. Lignite Briquettes

1. (a) Are lignite briquettes produced from lignite coal domestically?

(b) How much lignite is converted to briquettes annually?

(c) What have been the trends in lignite briquette production?

	<u>Tons</u>	<u>\$ Sales</u>
1965		
1977		
Projected 1985		

2. Where are the major briquettes manufacturing plants located?

3. Is the industry owned privately, by the government, jointly or otherwise?

4. What is the current price of lignite?

5. (a) Are lignite briquettes imported or exported?

(b) To and from whom?

(c) How much?

	<u>Tons</u>	<u>Sales</u>	<u>Imported or Exported</u>
1965			
1977			
Projected 1985			

I. Uranium and Thorium

1. (a) Are there domestic reserves of uranium and/or thorium?

(b) How extensive are the uranium reserves estimated to be?

Known

Probable

Possible

Quality of:

Uranium

Thorium

Source of
Estimate:

2. (a) Is uranium or thorium being produced commercially?

(b) What has been the historical gross output by year?

Tons

Sales

1973

1977

Projected 1985

3. (a) What is the average cost of a ton of uranium oxide (yellow cake)?

(b) How has this changed over time and what is the projected cost?

Cost per Ton

1973

1977

Projected 1985

4. (a) How much yellow cake is exported?

	<u>Tons</u>	<u>Sales</u>
1973		
1977		
Projected 1985		

5. What are the national plans and goals for the development of the uranium resources?

J. Geothermal

1. (a) Have geothermal resources been developed for electricity production?

(b) What is the current generating capacity?
2. (a) Do economically viable geothermal reserves exist?

(b) Where are they located?

(c) Are significant exploration efforts underway or planned?
3. Describe any plans to develop geothermal resources in the country, including their extent, cost, and projected output.

V. Electric Utility Resource Base

1. What is the legal status of the electric utility? (Government agency, state-owned corporation, private company, etc.)

2. (a) What is the installed electric generating capacity in MW?

	<u>Hydro</u>	<u>Coal</u>	<u>Oil</u>	<u>Gas</u>	<u>Nuclear</u>
Projected					
Projected					

(b) How many plants are there in each of the following categories?

	<u>100kw</u>	<u>10MW</u>	<u>10-100</u>	<u>100 MW</u>
Projected				
Projected				

3. (a) What is the location of the majority of plants? (If there are few major electric producing plants then list plants, capacity, energy output, and year of construction).

(b) How extensive is the existing electricity transmission and distribution system? (Attach a map of the power grid, if possible).

4. (a) How much electricity is sold out of the country?

_____ kwh

(b) How much electricity is bought from foreign countries?

_____ kwh

5. (a) How much electric energy has been sold annually?

Total Energy Sales

(KWH)

1965

1977

Projected 1985

Projected 2000

5. (b) What were the 1977 electricity sales to different customer classes?

1977 Energy Sales

(KWH)

Urban: Residential

Commercial

Rural: Residential

Commercial

Industrial:

Government:

Other: _____

Total

(c) How many customers in each class are legally connected to the utility grid?

Number of Customers

(1977)

Urban: Residential

Commercial

Rural: Residential

Commercial

Industrial:

Government:

Other: _____

(d) Have illegal electricity connections been a problem in urban or rural areas?

(e) Does the government limit or ration electricity use or hookups? Describe below:

6. (a) What method(s) is/are employed in pricing electricity?

_____ Fixed charge
_____ Demand charge
_____ Energy charge
_____ Other: _____

(Check as many as apply)

(b) Does the pricing method vary with different customer classes and regions? Describe below:

(c) What is the current price of electricity for different user classes? (Note: explain regional differences on a separate sheet).

6. (c) Fixed Demand Energy
(per month) (per peak Kw) (per Kwh)

Industry

Industry	Fixed (per month)	Demand (per peak Kw)	Energy (per Kwh)
Urban Residential			
Urban Commercial			
Rural Residential			
Rural Commercial			
Government			
Other			

(d) If special pricing methods apply to a rural electrification program, describe them below:

(e) What is the production cost of electricity per kwh? _____

7. (a) What percentage of the urban population is served by electricity. _____%

(b) What is the current status of rural electrification: What percentage of the total rural population or village is served by electricity. _____%

(c) Describe the major government or utility policies and attitudes toward rural electrification.

8. (a) What plans are being made for rural electrification?
% of villages served by electricity
Projected 1985
Projected 2000
- (b) To what extent have past programs met planned goals?
- (c) Has there been planning for decentralized rural electrification? (e.g., low head hydro, diesel generators.)
9. (a) What are the anticipated capital costs for new power plants?
- (b) Is this a constraining factor in future electrification programs?
10. (a) What is the potential for expanding the use of hydro-power?
- (b) What are the primary national plans for accomplishing this?

11. (a) What is prevailing attitude toward the need for nuclear power?

(b) Have any plans been made in this direction? With the cooperation of which nations?

12. (a) What foreign countries are participating in the expansion of the electric industry, if any?

65'

VI. Agriculture

1. (a) What are the country's major agricultural products (by region)?

(b) What are the levels of production? Give number of production units (e.g., tons of rice or wheat and number of livestock).

(c) How many people work in agriculture? (by crop and region where possible).

2. Describe the general farming practices and processes for each major agricultural product. Determine qualitatively how much of the work is mechanized. What technologies are used. How many energy using machines are in use (e.g., tractors)? What fuels? For crops, how much fertilizer, insecticide and what types are used? How are crops irrigated? NOTE: The answer to this question should be as quantitatively detailed as possible. Cover the following areas for each crop:

plowing, winnowing, seeding, fertilizing, pesticides, irrigation, weeding, harvesting, further preparation prior to market.

3. What are the trends in agricultural production methods? (i.e., how rapidly is the agricultural sector becoming mechanized? What are the expectations for the future)?
NOTE: Again, answer in detail; emphasize the crops and methods that are in transition; attempt to quantify answers.

4. (a) How far must agricultural products be transported to markets? In what quantities?

(b) What forms of transport are used?

5. What plans exist to diversify agricultural output? (e.g., new crops).

6. (a) What percentage of the total national food requirement is produced domestically?
- (b) What agricultural products are imported? How much? From what countries?
- (c) What agricultural products are exported? How much? Where to?
7. (a) How did the increase in energy costs since 1974 affect the agricultural sector?
- (b) How much has the cost of fertilizer increased?
- (c) Are fertilizer and pesticide produced nationally or are they imported? From whom?

		<u>Fertilizer</u>	<u>Pesticide</u>
1) Domestic Production:	1965		
	1970		
	1977		
	Projected - 1985		
<hr/>			
2) Imported:	1965		
	1970		
	1977		
	Projected - 1985		

8. (a) What have been the major problems in the past that affect agricultural production?

(b) What major problems are foreseen for expansion of agricultural output? (e.g., water shortages).
9. (a) Are there major national programs or plans to expand agricultural production?

(b) Are there any major international or foreign programs in agriculture?
10. Describe the principal agricultural processes and technologies? What are the fuel requirements of each?
11. Are major changes planned in transportation that will affect the agricultural sector? How?
12. How important is the fishing industry in meeting national food requirements?
13. Describe the fishing industry (e.g., number of fishermen; tons of fish produced annually; methods used;) major energy consumption points.

14. Are fish products exported? Describe fully.

15. Are there any experiments or plans to experiment with solar energy or wind power in the agricultural sector? Have the experiments been successful?

VII. Industrial Sector

I. Sectoral Statistics

1. (a) What are the major industrial goods produced (give annual output and monetary value) by region?

(b) How many people are employed in each industry?

2. What is the production capacity of each major industry?

3. Describe briefly the manufacturing process or methods that are employed in each major industry. How mechanized are the industrial plants?

4. What are the annual energy purchases by each industry? Give quantities or monetary value of electricity, petroleum, coal, gas, wood, or other fuels used by each industry.

5. To what extent are self-generated fuels (e.g., small hydro-power, cogenerated electricity, wood, bagasse, etc.) used by industry? Give quantities used and measurement units.

6. How important is "informal" industrial activity in the nation?
 Some indicators of this would be: products produced, materials used for production, energy sources used (commercial and traditional) and any available statistics on sales, production, or number of workers involved in the sector.

II. Production of Principal Industrial Goods

(e.g., iron and steel, mineral extraction and processing, fertilizer, cement, textiles, food processing)

Industry and/or Firm _____

1. What is the annual production output (quantities and value)?

Product	Annual Output Quantity (Units)	Value

2. How many major facilities or production facilities are in operation? Give name, annual output, and work force for each.

Location	Owner	Annual Output	Labor Force

3. What are the current plans for changes in the size of industry (e.g., employees, new plants, etc.)?

4. What are the principal technologies employed at each factory? Are these expected to change over the next several years?

5. What is the annual use of commercial and/or self-generated fuels? How much is imported?

a. Per unit of production:

Units _____

Electricity
Petroleum
Coal
Gas
Wood
Other: _____

b. Total for Industry, Firm, or Plant:

Energy use by: _____

Annual Output: _____

quantity or value

Electricity
Petroleum
Coal
Gas
Wood
Other: _____

6. Describe the energy uses in the industrial processes employed in this industry? Give demand for direct heat, process steam, hot water, hydro carbon feedstocks (petroleum or other organic substances) in energy value and temperature range, if possible.

Energy Use Per Unit
(Measurement Units: _____)

Name of Process	Electricity	Petroleum	Other Fuels

7. Has the potential for increased use of inexhaustible fuels been examined, particularly: hydro mechanical, combustion of agriculture or wood wastes, solar direct heat, wind, etc.?
8. How is the mix of energy, labor and capital expected to change over the next several years?
9. How has the increase in energy prices since 1974 affected the industry?

VIII. Transportation

i. ROAD TRANSPORT

Describe, qualitatively, the road transportation system in the country emphasizing the mix of vehicles, rural and urban mobility characteristics, primary transport needs, etc.

A. Autos, Trucks, Buses

1. How many automobiles and commercial passenger or shipping vehicles are currently in operation?

What is the rate of growth of vehicle registration?

	<u>1965</u>	<u>1977</u>	<u>Projected</u> <u>1985</u>
Autos	_____	_____	_____
Trucks	_____	_____	_____
Buses	_____	_____	_____

Are these from actual registration or based on estimates?

What percentage of vehicles are operated in rural areas?

2. What is the annual average distance drive per vehicle in the following categories?

	Kilometers	and/or	Tonnage
Autos			
Trucks			
Buses			

3. What is the total in-country fuel sales for 1965, 1977 and projected to 1985?

Total Fuel Sales			
	1965	1977	1985
Autos			
Gasoline			
Diesel			
Trucks			
Gasoline			
Diesel			
Buses			
Gasoline			
Diesel			

Who owns these vehicles?

	Private	Commercial	Government
Autos			
Trucks			
Buses			

4. If statistics are not available for fuel sales, estimate the average fuel efficiency for each vehicle class.

Auto _____
Trucks _____ (km/liter)
Buses _____

What makes of automobiles are popular now?

5. What is the estimated age of the vehicle fleets?

Auto _____
Trucks _____
Buses _____

6. Are there specific programs or industrial development plans that will significantly change transportation patterns? (e.g., new auto manufacturing plant coming into operation; upgraded road systems.)

B. Motorcycles

1. How many motorcycles are registered in the country?

	1965	1975	1985 (projected)
Ownership			
Private			
Commercial			
Government			

2. What is the estimated annual average mileage for motorcycles?

3. What are the popular models; engine size? _____cc

4. What is the projected growth rate in use and ownership?

C. Non-motor Vehicles

1. Describe the dominant non-motorized vehicles and forms of transport. What are they used for?
Approximately how many various vehicles are in use?

2. Are these vehicles produced locally or imported?
Elaborate.

3. How affordable are these vehicles to the average household? What percentage of households owns a vehicle?

4. What are the trends in non-motor transport?

II. RAIL TRANSPORT

1. Generally describe the usage of the train system in the country. How important is it as a means of transport for passengers and freight? How extensive is the rail system?

2. What is the annual:

(a) Passenger mileage _____

Freight mileage _____ tonnage

(b) Fuel consumption:

	1965	1977	1985
Diesel (barrels)			
Coal (tons)			
Electricity (kwh)			

3. Are there plans for significant additions in rail service, track mileage, or equipment stock?

III. BOATS AND SHIPPING

1. Generally describe the shipping transport industry. Is it a major passenger transportation mode or predominantly for freight?

2. What are the annual fuel use statistics for the major boat lines?

	1965	1977	Projected 1985
Diesel			
Fuel Oil			

3. What is the approximate level of service provided? (ton-miles, passenger-miles or boat-miles).
4. Is sailing a major component of the commercial marine traffic?
5. What trends or development plans exist for future marine shipping and passenger service?

V. AIR TRANSPORT

1. Is there a national airlines? What service is provided by carriers from other nations?

2. How much fuel is consumed annually by scheduled commercial air carriers?

1965 1977 Projected 1985

3. How many private planes are registered in the country?
How much fuel is sold to small plane owners annually?

4. How many passengers fly on routes:
to other nations? _____
within the nation? _____
on an annual basis? _____

5. What are the current plans to expand air service, purchase new planes, or introduce new air routes in the future?

6. How important is air service for:

- international travel?
- domestic travel?
- import/export of goods?
- domestic trade and distribution of commercial goods?

V. TRANSPORTATION FACILITIES

Describe the transportation infrastructure and facilities currently existing and planned for the nation:

1. Roads

	1965	Distances Km 1977	Projected 1985
Suitable for motor transport:			
Suitable for non-motorized transport only:			
Served by ferries:			
2. Railroad Mileage:			

3. Marine Transport

	Name	Annual Tonnage
Major Navigable Rivers		
Major Harbors		

5. If available, attach maps of the different transportation networks, schedules, lists of facilities, data on passenger use, prices, freight moved, etc.

IX. Residential/Commercial

Energy consumption in this sector is difficult to measure because of the non-commercial fuel sources involved and the often inefficient end-use methods employed. Its significance for the future, however, is potentially great. With general economic growth there is a tendency for fuel shifts or substitutions to move from the non-commercial to the commercial, leading to a substantial change in the national energy consumption structure. This change is influenced by urbanization, increased incomes and consumer preference, more readily available commercial fuels, increased consumption density through high rise and public housing and government programs.

I. Population, Housing and Fuel Availability

1. Characterize the urban and rural population distribution:

	Number	Combined Population
Cities over one million		
Cities 100,000-1,000,000		
Cities 10,000-100,000		
Towns 1,000-10,000		
Villages below 1,000		
Other rural areas		
Total Population		

2. What is the average household size:

Rural _____ Village _____ Urban _____

3. How extensive is public housing?

Number of units _____

Cities located in _____

Are utility hookups provided? _____ Electricity

_____ Gas

Estimated average use per unit

_____ Electricity

_____ Gas

4. Approximately how many people live in "unrecognized" or squatter settlements? _____

What fuels are used in these settlements?

Cooking _____

Heating _____

Hot Water _____

Other _____

5. How many housing units exist in privately-owned, multi-family houses? _____

6. What are the historical and current prices for residential energy forms?

Fuel Type	Fuel Price		
	1965	1975	1978
Kerosene	Urban		
	Rural		
Gas/LPG	Urban		
	Rural		
Electricity	Urban		
	Rural		
Firewood	Urban		
	Rural		
Charcoal	Urban		
	Rural		

Other: _____

Note: List units used for each fuel type. For electricity, attach rate schedules or list the rate paid at a "typical" residential customer level of consumption (for

example, 50 kwh/month for rural customers and 200 kwh/month for urban customers).

Describe any significant regional differences below:

7. Does the government control residential fuel prices?

Yes _____ No _____

Does the government provide fuel subsidies to residential users?

Yes _____ No _____

8. Does an established firewood market exist in:

<u>Yes</u>	<u>No</u>	<u>Average Current Prices</u>	
_____	_____	Large cities	_____
_____	_____	Major towns	_____
_____	_____	Villages	_____
_____	_____	Rural Areas	_____

9. a. What fraction of the urban population has electricity?

b. The rural population? _____

c. What are the general uses in urban and rural areas?
(lighting, heat, appliances, etc.)

Urban	Rural

d. What types of appliances are commercially available in urban and rural areas?

10. a. What fraction of the urban population has access to gas utilities? _____

b. Is gas available in rural areas? _____

c. What are the general residential uses of gas? (i.e., cooking, heating, etc.)

II. Residential Energy Use Patterns

1. Rank the following energy uses by magnitude of household energy use and importance to social well-being. (Note: This is a subjective assessment to be made either by

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the interviewer or one of many host country interviewees.) Rank numerically from 1-7, where 1 is largest household energy use or most important and 7 is smallest use or least important.

Energy Use	Magnitude of Household Energy Use		Importance of Energy Use to Social Well-being	
	Rural	Urban	Rural	Urban
Cooking	_____	_____	_____	_____
Space Heat	_____	_____	_____	_____
Lighting	_____	_____	_____	_____
Space Cooling	_____	_____	_____	_____
Refrigeration	_____	_____	_____	_____
Domestic Hot Water	_____	_____	_____	_____
Other _____	_____	_____	_____	_____

2. Describe the general residential energy use patterns by end-use and fuel used. In particular:

a. What fuels are used for cooking and water heating in

urban areas?

electricity _____

kerosene _____

gas _____

wood _____

charcoal _____

other _____

c. How many residences have space cooling systems (air-conditioners and fans)?

What types of residences are these (apartments less than ten years old, etc.)?

What fuel types are used for air-conditioners?

Are records available describing air conditioner sales or ownership? If so, either attach them or give the number currently in use. Their level of use, efficiency, and trends in installations.

d. Is electricity available for lighting in rural and urban residences? How many:

What other fuels are used for lighting?

kerosene firewood other: _____

How many people employ each fuel in rural and urban areas?

Are buildings lit only during evening hours?

Are urban or rural electricity customers limited to a maximum number of light bulbs per house?

_____ Rural _____ Urban _____ Both _____ Neither

How many: _____ What size: _____

Are illegal hookups a problem? _____

Describe the extent of the problem _____

e. What other energy-consuming appliances or practices are found in the residential sector?

What fuels are used, how extensive is the energy use, and what regional/income variations are observed?

3. What types of equipment are used for cooking and space heating in urban and rural areas?

	Fraction of Population Using this Facility	
	<u>Urban</u>	<u>Rural</u>
<u>Cooking:</u>		
Commercial Stove	_____	_____
Clay Oven	_____	_____
Local Metal Oven	_____	_____
Open/covered Pit	_____	_____
Hearth	_____	_____
Open Fire	_____	_____
<u>Space Heat:</u>		
Central Heating	_____	_____
Commercial Stove	_____	_____
Hearth	_____	_____
Open Fire	_____	_____

4. How do energy consumption patterns (especially appliances, space cooling and lighting) change with personal income levels?

5. Do energy use patterns change between different cultural regions of the country, either due to lifestyle or building design differences?

III. Future Development Trends

1. What are national housing development plans and goals, particularly plans to construct additional public housing?

2. What have been growth trends in villages and farms, especially regarding the introduction of energy-consuming appliances and design features?

3. Are there any development plans for changing village structure or rural organization?

4. Are new appliances becoming more available in the nation (i.e., air-conditioners, refrigerators, etc.)?

5. What is the current level of production or importation of energy-consuming residential appliances?

Units per Year Produced or Imported

Air Conditioners	_____
Refrigerators	_____
Other _____	_____

6. Is there a national rural electrification program underway? ____ Yes ____ No If so, how many villages and/or residential units will be electrified by 1980 and/or 1985 (or other future year)?

	1980	1985
Number of villages electrified:	_____	_____
Projected number of customers:	_____	_____
Estimated per-residence consumption:	_____	_____
Anticipated annual sales	_____	_____

(Note: For planning purposes, what is the maximum population of a "village"? _____)

7. Is deforestation an actual or potential concern?
 ____ Yes ____ No If so, either describe the nature of it on a separate sheet or attach an explanatory document.

- Current Problem
- Anticipated as a problem within ____ years
- Firewood is not important as a "traditional fuel"
- No anticipated firewood shortage for residential users
- Other: _____

8. How extensive is the "recognized" home-building industry?
 How many housing starts are anticipated for 1978?

Home Type	Number of Units to be Built in 1978
Single-family	
Multi-family	
Apartments	
Other	

9. Is over-urbanization a current problem?

Yes

No

Anticipated within 10 years

10. Which cities are likely to suffer over-urbanization?

What is the current or anticipated immigration rate, and how much of this contributes to barrio growth?

Name of City	Annual Immigration		Fraction Contributing to Barrios	
	1978	1985	1978	1985
1.				
2.				
3.				
4.				
5.				

IV. Commercial Sector Energy Use

1. What kinds of commercial buildings (e.g., shops, hotels) are major users of electricity and other purchased fuels? Describe the major uses of fuels (i.e., lighting, air-conditioning, food preparation, etc.) in these buildings and which fuels they use.

2. Hotels:

- a. About how many large tourist hotels are there in the country? _____
- b. Where are they located? _____

- c. Are most air-conditioned? _____
- d. Well-lighted? _____
- e. Are they major users of electricity in the country?

3. Large Retail Stores

- a. About how many new department stores or arcades have been built recently? _____
- b. Which cities are they located in? _____

- c. Are they air-conditioned? ___ Yes ___ No
- d. Are they heated? ___ Yes ___ No

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If so, what fuels are used?

Electricity _____

Gas/LPG _____

Fuel Oil _____

Other _____

e. Do you anticipate further construction of large, modern retail stores? ___ Yes ___ No

If so, how many?

4. Small stores, shops and cafes

a. Do small shop owners have access to electricity and pipeline gas for lighting, cooking, heating and cooling?

(Check one or more blanks.)

	<u>Electricity</u>	<u>Gas</u>
Very few in country	_____	_____
Some in urban areas	_____	_____
Many in urban areas	_____	_____
Some in towns and villages	_____	_____
Many in towns and villages	_____	_____
Virtually all in the country	_____	_____

b. What are the principal uses of gas and electricity by small shop owners? (Check as many as apply.)

	<u>Electricity</u>	<u>Gas</u>
Lighting	_____	_____
Heating	_____	_____
Cooling	_____	_____
Food Preparation	_____	_____
Food Storage	_____	_____

c. What other fuels are used by small shop owners (i.e., firewood, kerosene, residues, dung, etc.)? (Check one or more blanks.)

	<u>Kerosene</u>	<u>Firewood</u>	<u>Other</u>
Used by very few	_____	_____	_____
Some in cities	_____	_____	_____
Many in cities	_____	_____	_____
Some in towns & villages	_____	_____	_____
Many in towns & villages	_____	_____	_____
Virtually all in country	_____	_____	_____

d. What trends have been observed in substituting commercial fuels for traditional fuels used by small shop owners?

5. Government and Commercial Office Buildings

a. Have many new office buildings been recently built in major cities? _____

Which cities? _____

About how many during the past few years? _____

How large do they tend to be (in either floor space or height)? _____

b. Are most buildings for government offices or private business? _____

c. Are most business occupants domestic companies or foreign/multi-national corporations?

d. Are most office buildings:

	Yes	No
Air-conditioned?	___	___
Well-lighted?	___	___
Insultated?	___	___
Designed with passive solar features?	___	___

6. Fuel Use Statistics

If statistics on fuel consumption, sales of energy-consuming appliances, or energy sales are available, either attach them separately or use them to fill out the table below. Information for this table may be obtained from interviews with host country officials or businessmen.

- a. What fraction of businesses in urban and rural areas employ different fuel types for various end-uses?

Use Table 6a to summarize estimates of the fraction of each business class using a given fuel source for lighting, heat, etc.

- b. Estimate the typical size and number of commercial establishments in each category.

	<u>Est. number</u>	<u>Typical size</u>
Tourist hotels	_____	_____ rooms
Large retail stores	_____	_____ floor area
Arcades, Malls	_____	_____ floor area or _____ number of shops
Small shops	_____	_____ *

*May be given for nation, for a particular sized town (specify size)

C. Quantitatively estimate the number of establishments in each commercial class that use the level of energy specified below:

	<u>Lighting Level</u>		<u>Interior Climate Control</u>			
	<u>Low</u>	<u>High</u>	<u>Heated</u>	<u>A/C</u>	<u>Fans</u>	<u>None</u>
Tourist Hotels						
Large retail shops						
Small urban shops						
Small village shops						
Urban Office Bldgs.						
Other:						

D. If fuel use records (or utility bills) are available for specific commercial buildings, either attach them or fill out the table below:

Building Type	Name and Location	Energy Use for:				Size
		Year of _____; or Month of _____				
		Elec.	Gas	Petrol	Other	

(Note: Please tell if these buildings are "typical" for the country, how they are unique, and describe their energy-consuming features below).

TABLE 6a

Percentage of Commercial Sector Using This Fuel Form

Lighting

	<u>Lighting</u>					<u>Heating/Cooling</u>						
	Elec	Petrol	Gas	Wood	Other	None	Elec	Petrol	Gas	Wood	Other	None
Tourist Hotels												
Large Retail Stores												
Small Shops* Urban												
Rural												
Office Buildings												
Other: _____												

Cooking

Other: _____

	<u>Cooking</u>					<u>Other: _____</u>				
	Petrol	Gas	Wood	Other	None	Petrol	Gas	Elec	Wood	Other
Tourist Hotels										
Large Retail Stores										
Small Shops* Urban										
Rural										
Office Buildings										
Other _____										

* Include retail stores, cafes, bazaars, services, etc.

x. Government Energy Organization

An indication of a government's commitment to confront its energy problems can be provided by analyzing the organization it has created for and charged with this responsibility.

1. Has the government established or identified an office responsible for energy affairs? What is its position in the hierarchy?

2. How large is the staff and how extensive is its responsibility. What is its level of funding? Does it appear adequately funded for its assigned task?

3. Does the staff have a policy or technical orientation? What political authority does it have to accomplish objectives?

4. Describe in detail current programs and plans for future efforts. (Acquire documents where possible).

5. What institutional barriers impede the office's effectiveness?
(Note: This is subjective and should be answered privately)

6. How does the staff perceive the nation's energy situation?

7. How does the office staff view its task? How does it perceive its effectiveness?

8. Determine a consensus from the donor community and other government offices of the current and potential effectiveness of the energy affairs office.

9. What is role of bilateral and multi-lateral assistance organizations in local energy development programs and projects? Briefly describe these efforts.

XI. Local Receptivity

Two principal factors in the effective introduction of new technologies or changes in energy consumption patterns will be local perceptions of need and the extent to which the changes are consistent with local social realities.

Answers to the following questions, received through direct solicitation or intuitively developed, can provide an idea of the community's receptivity.

1. Where have most of foreign trained personnel received their education?
2. Have technicians with the most program responsibility been trained locally or abroad?
3. How much technical training is conducted at local university?
How much technical research is conducted at local university?
4. What is the governmental, professional, business and general public perception of the nation/s energy situation and their personal energy needs?

5. What is educated/professional community's attitude towards technological change? What is the general public attitude towards technological change?

6. Does a general understanding exist of the social benefits to be realized through adopting new energy technologies or changing energy consumption patterns?

7. What are the social obstacles to introducing alternative energy technologies and systems? Which aspects are receptive?

8. How many technical options exist given the current social system, village structure and cultural institutions?