



Data Requirements for Energy Planning and Mitigation Assessment

Because LEAP is a very general purpose software tool, which can be used to build a wide variety of different models of energy systems, it is impossible to definitively describe its data requirements.

Many parts of LEAP are optional such as the Transformation (energy supply) analysis, pollution and GHG emissions analysis, costing analysis, and non-energy sector GHG accounting. Compared to other energy modeling approaches, LEAP's initial data requirements are relatively simple. Nevertheless, they can still be quite daunting.

Equally as important, data requirements, especially in a demand analysis, will depend enormously on whether you develop an aggregate, top-down data set, which describes total consumption of the fuels in each major sector, or a disaggregated, bottom-up data set that examines how fuels are consumed in the various devices and end-uses in each different subsector of the economy.

Nevertheless, the following list is an attempt to describe some of the basic data you will require to help develop an initial national-level LEAP data set. In most cases it is very valuable to have current data and historical data (to help you establish trends) and projections for the future. Early-on in your work, it is important to choose the year you will use as your study base year. In general, you should choose the most recent year for which data is widely available.

It is also highly unlikely that all of the data you need will be available in-country. You will probably need to supplement available data by looking at international sources of data or by utilizing data from neighboring countries with similar energy infrastructures. The COMMEND web site (www.energycommunity.org) has a library page that is a good place to start looking for relevant international sources of publicly available data. Finally, you will inevitably need to supplement data with your own estimates. It is therefore vital that you talk with colleagues and establish good working contacts and data exchange arrangements with relevant institutions including statistical agencies, governmental ministries (energy, environment, transport, finance, etc.), utilities, and academic organizations.

Demographic Data

- National population data (historical and official government projections)
- Rates of urbanization (historical and official government projections)
- Average household sizes (historical and official government projections)

Macroeconomic Data

- GDP data (historical and projections)
- You may wish to link your LEAP energy sector analysis to a broader macroeconomic analysis or macroeconomic model.

General Energy Data

- Current and past **national energy balances** with data on energy consumption and production by sector or subsector. **NB: Energy balance data is the single most important data requested here!** If possible energy balances should include sections describing energy consumption (by sector and hopefully by subsector), energy conversion, statistical differences (between demand and supply) and a summary of primary energy production, imports, exports and stock changes.
- Documents describing national energy policies and plans and GHG mitigation assessments for the country.

Energy Price Data

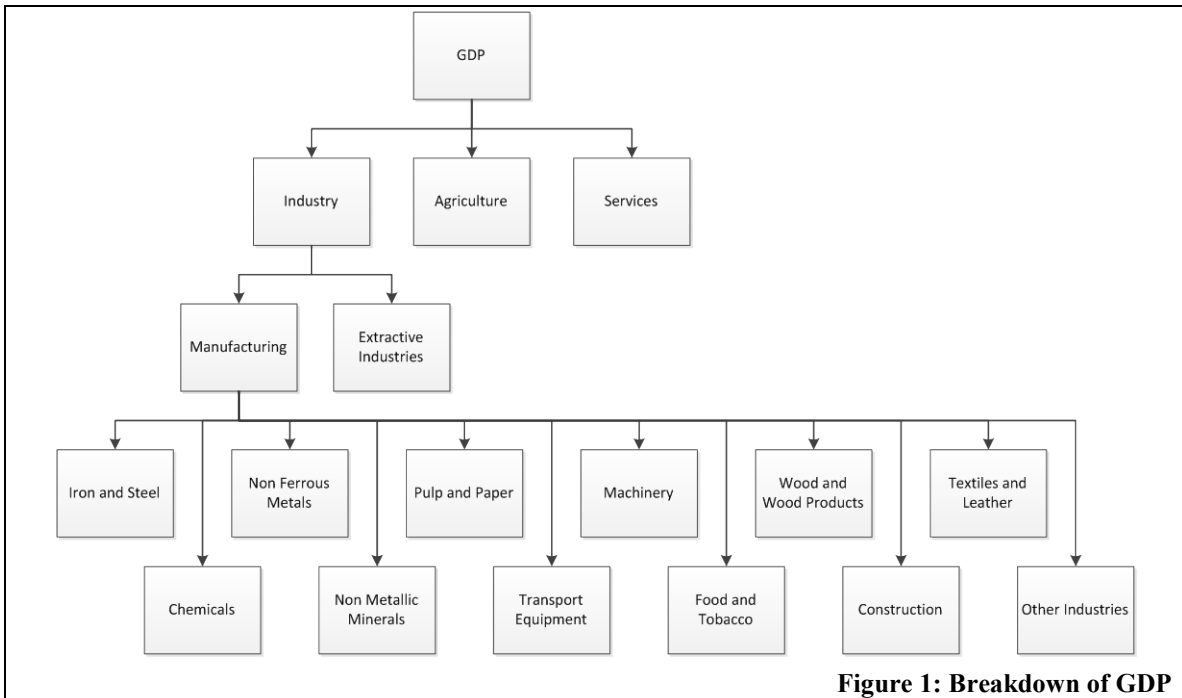
- Available data describing current and historical national energy prices for major fuels (coal, natural gas and major oil products) as well as for electricity. If possible please distinguish the prices charged to major sectors (households, industry, commercial sales).

Elasticities

- Any studies that have examined the elasticity of energy demand with respect to prices and/or income levels.

Demand Forecasting

- **Activity Levels:** Energy forecasts rely on projections both of energy intensities (energy per unit activity) and overall activity levels. Activity data varies from sector to sector. One approach for forecasting energy relies on using economic value added by sector and subsector as the activity level data. If possible, provide current and historical breakdowns of total GDP by describing how value added by sector and subsector has changed over time. This data may be available from Planning or Finance ministries. A type breakdown of GDP is as follows:



- Alternatively, for large energy intensive industries producing reasonably homogenous products (such as iron and steel, cement aluminum, etc.) measures of physical production may be a better measure of activity level. If possible provide current and historical measures of physical production from any major industries (e.g. tonnes of cement). Also, if possible, provide any information about likely major changes in the outlook for these sectors. For example, are major new plants planned or are large scale facilities likely to be started up or shut down?
- For forecasting transportation energy use, a typical approach is to consider the overall demand for passenger transport (measured in Passenger-kms) and Freight transport (measured in tonne-kms), bearing in mind how the total of each is split between different modes (road, rail, air, water) and different technologies (buses, cars, taxis, motorcycles, etc.). If possible provide any national data describing the current, historical and future projections of tonne-kms and passenger-kms and where possible their breakdown by mode and technology. Such data may be available in national statistical reports or by contacting Ministries of Transport or academic organizations working in specific sectors.
- **Energy intensity data** is often very hard to come by. Most likely it will need to be calculated initially by combining data on total energy use by fuel (see above) with data on activity levels (also see above). However, if any data on energy intensities in different sectors has been collected, please do collect and send it. Such information may be available from recent social or energy consumption surveys or reports from utilities.
- **Forecasting household energy consumption.** This sector is one of the most difficult and complex to forecast because data availability is often very poor while energy use patterns vary dramatically between high and low income households;

between urban and rural households; and among different housing types (single family, multi-family, etc.). If possible, please provide the results of any recent household energy surveys or studies. Particularly useful, are data that describe how energy consumption varies by income level or between urban and rural households. Also useful are data describing household energy use for different end-uses (e.g., cooking, lighting, heating, cooling, refrigeration, electronics, etc.) as well as data describing the levels of ownership and types of technologies (fuels used, efficiencies, market penetrations) employed within each end-use.

Energy Supply Data

- **Electric Generation:** The following types of data are needed to adequately model electric generation. If your country has more than one power grid, please try to provide this type of data separately for each major grid:
 - Current and historical **installed capacities** (MW) of each major type of power plant.
 - **Historical generation (GWh)** from each major type of power plant.
 - Average **energy efficiencies** or heat rates of each major type of power plant.
 - Costs: Any data describing capital (\$/MW), fixed (\$/MW) and variable (\$/MWh) operating and maintenance and fuel costs (\$/GJ) of each major type of power plant.
 - Data describing the seasonal load shape for your electric system(s) e.g. MW hourly peak load.
 - Data describing the percentage maximum availability and, if possible, the dispatch priority of each type of power plant. If possible provide data showing planned vs. unplanned outages of each major type of power plant.
 - Feedstock fuels: please describe the types of fuels used by each major type of power plant.
 - Any capacity expansion plans describing what types of power plants are likely to be built in the future.
 - Transmission and distribution losses (%) if possible including both technical and non-technical losses.
 - In some countries, combined heat and power (CHP) production is becoming increasingly important. If possible provide similar types of data for CHP as listed above for electricity generation. Also if possible describe the production efficiencies for both electricity and heat.
- **Oil Refining:** If oil refining is an important sector in your country, please try to provide current and historical data describing the different feedstock fuels and products produced by refineries, their efficiency and the capacity of the refineries (TOE/year) as well as data describing historical imports and exports of crude and oil products.

- **Other major sectors:** if your country has other major energy conversion sectors such as charcoal making, coal liquefaction, gas works, ethanol production, heat production, combined heat and power, etc. please try to provide basic data describing these sectors including descriptions of the fuels used and produced, process efficiencies, and current and future planned capacities of processes.
- **Extraction sectors:** If extraction sectors such as coal mining or oil and gas production are important, try to provide data describing the efficiency and capacity of these sectors as well as information on the fuels produced and the energy consumed during extraction. If possible provide data on fossil reserves in the country.
- **Renewables:** Renewable energy is becoming increasingly important in many countries and may be an important focus of any GHG mitigation analysis. If possible, provide data describing the technical and economic resource potential for each major type of renewable (e.g. GJ/Year for hydro, wind, solar, geothermal, biomass, etc.)

Energy Sector Emission Factors

- For a first cut GHG mitigation assessment IPCC “Tier 1” emission factors are generally used. However, these can be overridden by more specific national emission factors where appropriate. For example, cars or electric power plants in your country may have particular emissions characteristics. Please provide any national appropriate emission factors that may be used in your country.

Non-Energy Sector Sources and Sinks of GHGs

- The EDGAR database from PBL provides a first cut estimate of non-energy sector GHG sources and sinks for most countries. However, national estimates of non-energy sector emissions and sinks may be more accurate and appropriate. Especially important in many countries are estimates of net emissions from a) land-use change and forestry, b) agriculture and c) industrial processes (non-energy related). If current or historical estimates of non-energy sector sources and sinks of GHGs are available please provide those. In addition, if there are any projections of these sources and sink into the future please provide those.

Fuel Characteristics

- Default international data describing fuels and their characteristics (energy content, chemical composition, etc.) is generally sufficient to meet the needs of most studies. However, in some countries, these characteristics are very different from international average values. If possible, please provide data describing the energy, carbon, moisture and sulfur content of fuels used in your country (especially for types of coal and biomass). Also please to provide data for any uncommon fuels produced or consumed in your country such as CNG, town gas, etc.

Energy Trade

- In some countries energy imports and exports may be important. Please provide historical data describing the annual imports and exports of any traded fuels. Please also provide any available data describing the historical capacity of electric interconnections, gas and oil pipelines and CNG/LNG port facilities as well as any plans to improve these infrastructures. Please also provide data describing the prices of these traded fuels (see above).