Energy and Resources

Source: International Energy Agency.

	Energy Consumption by Source, 1999						Energy Intensity, 1999			Sectoral Energy Consumption (% of total, 1999)		Final Electricity Consumption per Capita (kgoe) 1999
	From all sources			From fossil fuels (ktoe)	Renewables (ktoe)		Total (toe per million $intl) {a}	Industrial (toe per million $intl)	Residences per Capita (kgoe per person) {c}	Industry	Trans-portation	
	Total (ktoe)	% change since 1989	Per capita (kgoe)		Modern	Traditional						
Iran, Islamic Rep	103,635	68.4	1,497	102,422	0	786	3,802	317	303.0	23.4	21.8	109.7
Iraq	28,802	17.9	1,290	28,726	0	26	3,631	X	102.5	22.0	31.6	114.4
Israel	18,493	56.9	3,129	18,053	538.3	4	9,456	X	354.6	15.9	20.9	505.5
Jordan	4,871	52.4	1,018	4,803	64.24	3	2,796	167	169.7	16.0	27.3	102.8
Kuwait	17,289	0.9	9,356	17,289	0	0	25,154	X	1625.0	25.6	14.2	1254.9
Lebanon	5,469	136.1	1,591	5,234	7.04	125	4,535	243	258.5	17.4	29.1	190.0
Oman	8,469	197.1	3,447	8,469	0	0	8,579	X	162.4	25.9	12.6	236.7
Saudi Arabia	84,907	33.2	4,322	84,902	0	0	11,025	X	282.0	17.2	15.0	416.5
Syrian Arab Rep	18,049	69.1	1,144	17,296	0	5	3,046	255	91.9	21.9	8.8	74.3
Turkey	70,326	43.8	1,071	60,040	318.79	6,792	2,784	161	250.9	24.0	16.2	117.6
United Arab Emirates	28,085	60.0	10,979	28,068	0	0	26,218	X	433.5	44.3	9.2	1007.2
Yemen	3,139	8.0	178	3,061	0	77	487	X	X	5.4	45.9	9.2

An "X" indicates that data are not available. Toe: tons of oil equivalent, Ktoe: thousand (kilo-) tons of oil equivalent. Kgoe: kilograms of oil equivalent. a. Measures total energy use per million dollars of GDP (adjusted for purchasing power parity in international dollars).

Sources and Technical Notes

VARIABLE DEFINITIONS:

Energy Consumption by Source is the total amount of primary energy consumed by each country in the year specified. Primary energy includes losses from transportation, friction, heat loss and other inefficiencies. Specifically, consumption equals indigenous production plus imports minus exports plus stock changes minus international marine bunkers. IEA calls this value Total Primary Energy Supply (TPES).

Total from all sources is total consumption from all energy sources including fossil, nuclear, hydroelectric, modern renewables, and renewable fuels and wastes. **Total fossil fuels** include energy consumption from oil and natural gas liquids, coal and coal products, and natural gas. **Nuclear** energy consumption shows the primary heat equivalent of the electricity produced by nuclear power plants. Heat-to-electricity conversion efficiency is assumed to be 33% (its average in Europe). **Hydroelectric** includes the energy content of the electricity produced in hydro power plants. Hydro output excludes output from pumped storage. **Modern renewables** include energy from wind; tide, wave and ocean; thermal and phototvoltaic solar; liquid biomass fuels such as ethanol; biogas from digesters; and geothermal systems. Thermal solar represents solar radiation exploited for hot water production and electricity generation by: 1) flat plate collectors, mainly of the thermosyphon type, for domestic hot water or for the seasonal heating of swimming pools and 2) solar thermal-electric plants. Passive solar energy for the direct heating, cooling and lighting of dwellings or other buildings is not included. Solar from photovoltaics includes solar energy converted by photovoltaic cells to electricity. Wind includes electrical power generated from wind energy. Biogases are gases derived principally from the anaerobic fermentation of biomass and solid wastes which are combusted to produce heat and electrical power. Landfill gases and gases from sewage and animal waste facilities are included in this category. Energy from liquid biomass includes liquid derivatives from biomass used as a fuel. Ethanol is the main form of liquid biomass produced. Tide, wave, ocean represents the amount of energy from wave, ocean and tide activity is captured and transformed into electrical power. **Traditional renewables** includes primary solid biomass, i.e. any plant matter used directly as a fuel or converted into other forms before combustion, including wood, vegetal waste including wood waste and crop waste used for energy, animal materials and wastes, sulphite lyes (also known as black liquor, this is a sludge that contains the lignin digested from wood for paper making), and other solid biomass.

Energy Intensity: All Economic Sectors is the amount of energy consumed per unit GDP in PPP terms. The variable provides an indicator of how efficiently, in terms of energy, the economy generates wealth.

Energy Intensity: Industry Sector is the amount of energy consumed by the industry sector per unit of GDP in PPP terms generated by industry. This variable indicates, in energy terms, how efficiently the industry sector generates wealth. Please see the methodology section for how industry is defined for this indicator.

Energy Consumption by Residences per Capita is the average amount, per person, of energy consumed by the residential sector. The residential sector includes all energy used for activities by households except for transportation. The variable provides an indicator of how much energy people in different countries require for housing.

Energy Consumption by industry and transportation as a percent of total consumption is the percentage of the total amount of primary energy, from all sources, consumed by industry and transportation, respectively. The **industry sector** is for this variable is defined as the combination of all industrial sub-sectors, such as mining and quarrying, iron and steel, construction, etc. Energy used for transport by industry is not included here but is reported under transportation. **Transportation** represents both road and air transportation. Road transportation includes all fuels used in road vehicles,

including military, as well as agricultural and industrial highway use. The sector excludes motor gasoline used in stationary engines and diesel oil used in tractors. Air transportation includes both domestic and international air transportation. The domestic sector includes deliveries of aviation fuels to all domestic air transport: commercial, private, agricultural, military, etc. It also includes use for purposes other than flying, e.g. bench testing of engines, but not airline use of fuel for road transport. For many countries this also incorrectly includes fuel used by domestically owned carriers for outbound international traffic. The international air transportation sector includes deliveries of aviation fuels to all international civil aviation.
Final electricity consumption per capita is the amount of electricity, regardless of source, consumed on average by each person. Final consumption measures only the amount of energy delivered to the end user. Losses due to transportation, friction, heat loss and other inefficiencies are not included.

FREQUENCY OF UPDATE BY DATA PROVIDERS:
IEA updates their energy data annually. The UN Population Division updates the figures used for per capita calculations every other year. These updates also often include revisions of past data. Data may therefore differ from those reported in past editions of the *World Resources* report.

METHODOLOGY:
Energy Data:
All energy consumption values presented here are calculated and reported by the International Energy Agency (IEA) using an energy balance methodology using metric tons (tonnes) of oil equivalent (toe), a common unit based on the calorific content of energy commodities. One toe is defined as 10 Exp. 7 kilocalories, 41.868 gigajoules, or 11,628 GWh. This amount of energy is roughly equal to the amount of energy contained in a ton of crude oil. To account for the differences in quality between types of coal and other energy sources, the IEA has applied specific conversion factors supplied by national administrations for the main categories of energy sources and flows or uses (i.e. production, imports, exports, industry).

Energy statistics are expressed in terms of net calorific value and therefore may be slightly lower than statistics presented by other statistical compendia. The difference between the net and the gross calorific value for each fuel is the latent heat of vaporization of the water produced during combustion of the fuel. For oil and coal, net calorific value is 5 percent less than gross; for most forms of natural and manufactured gas the difference is 9-10 percent. Using net calorific values is consistent with the United Nations and European Community statistical offices.

The IEA has used the following conventions in accounting for primary energy such as nuclear, solar, geothermal, hydro, wind, etc.: 1) the first form of energy production with multiple practical uses is reported. This means that heat is the form reported for geothermal heat and electrical production, nuclear heat and electrical production and solar heat production. Electricity is the form reported for hydro, wind, wave and photovoltaic solar electricity production. 2) The physical energy content of the energy source is reported as energy production. For nuclear fuels, this is the heat energy produced in a nuclear reactor, for hydropower, it is the amount of energy in the electricity produced. Please refer to the original source for further information on the variables and collection methodologies.
Energy Intensity: All Sectors. WRI calculated energy consumption per GDP PPP using IEA data to divide total energy consumption by total GDP in PPP terms. IEA's GDP PPP data were used as they had already been converted into constant dollar terms. Gross Domestic Product (GDP), PPP in constant 1995 international dollars is gross domestic product

converted to international dollars using Purchasing Power Parity (PPP) rates, and rescaled to 1995 to give a common reference year. An international dollar has the same purchasing power in a given country as a United States Dollar in the United States. In other words, an international dollar buys an equivalent amount of goods or services in all countries. Please see the technical notes for the Economics Indicator table for more information on how data for GDP PPP is gathered and how the figures are calculated.

Industry Energy Intensity: Industry Sector. Industry GDP in PPP terms was calculated by multiplying GDP PPP (see above) and the percent of GDP generated by industry provided by *World Development Indicators*. Industry energy consumption is based on IEA data adjusted for the fact that the definition of industry and manufacturing used by the IEA is broader than that used by the World Bank. The World Bank defines the sector as including International Standard Industrial Classification (ISIC) divisions 15-37 (please see http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17 for more information on ISIC classifications). WRI subtracted energy consumed by mining and quarrying (ISIC Divisions 13-14) and construction (ISIC division 45) from IEA's total industrial energy consumption in order to closely align the definitions. The only differences remaining are that the World Bank definition includes the manufacture of coke, petroleum products, and other derived fossil fuels (ISIC division 23), manufacture of coke oven products (ISIC group 231), manufacture of refined petroleum products (ISIC group 232), and processing of nuclear fuels. According to the IEA, however, the energy consumed for these activities are captured by in the energy contained in the original fuels used for these processes. The differences remaining between the World Bank and IEA definitions of the industry and manufacturing sector should therefore by small.

DATA RELIABILITY AND CAUTIONARY NOTES:

Energy Data. The energy balances data are primarily based on well-established and institutionalized accounting methodologies, and are therefore considered reliable. One exception is fuel wood and other biomass fuels, which are estimated by the IEA based on small sample surveys or other incomplete information. The data give only a broad impression of trends and should not be strictly compared between countries. The IEA reports that it can be difficult to distinguish between agriculture, commercial, and public sectors, and there may be some overlap in these sectors. IEA data do not distinguish between no data and zero values. WRI has distinguished between the two where possible, but some values represented as zero should probably be indicated by an X and vice versa.

Please note that, in a departure from *World Resources 2000-01*, energy consumption by energy sector is based on *primary* energy supply as opposed to *total final consumption*. The figures should therefore not be used in conjunction with data from that edition to indicate change in any sector's relative energy use.

Energy Intensity Variables. A number of countries, particularly rapidly-developing countries, over-report GDP and the rate of GDP growth in their countries. This tendency will serve to make those countries appear more efficient than they actually are.

SOURCES:

Energy variables: International Energy Agency (IEA), 2001. *Energy Balances of OECD Countries (2001 Edition)* and *Energy Balances of non-OECD Countries (2001 Edition).* Paris: Organization for Economic Cooperation and Development (OECD). Electronic database available online at: http://data.iea.org/ieastore/default.asp. **Population** (used to calculate per capita values): Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2002. *World Population Prospects: The 2000 Revision.* New York: United Nations. Dataset available on CD-ROM.