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THE ENERGY ACCESS SITUATION IN DEVELOPING COUNTRIES

A Review Focusing on the Least Developed Countries and Sub-Saharan Africa

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FOREWORD

Energy is arguably one of the major challenges the world faces today, touching all aspects of our lives. For those living in extreme poverty, a lack of access to modern energy services dramatically affects health, limits opportunities and widens the gap between the haves and have nots. The vulnerability of the poor is only worsened with recent challenges from climate change, a global financial crisis, and volatile energy prices.

The global target date for achieving the Millennium Development Goals is only 6 years away. While there is no MDG on energy, the global aspirations embodied in the goals will not become a reality without massive increases in the quantity and quality of energy services. This is needed to meet the most basic needs of poor men and women, especially heat for cooking, and mechanical power. Also, improved household energy technologies for the very poor can prevent the almost 2 millions deaths a year attributable to indoor air pollution from solid fuel use. These have been central messages of UNDP and of WHO. However, this report shows that progress has been painfully slow in expanding access to modern energy services, particularly in poorer countries, presenting a major roadblock to meeting the MDGs.

Policies and national programmes must be drastically enhanced to tackle in any significant way energy poverty. This cannot be done effectively without a clear understanding of the energy access situation in countries, including understanding regional and national trends, rural/urban disparities, and the range of energy sources typically used in the households of the poor. Yet, existing global data sets and reports often provide insufficient information on energy access, focusing instead mostly on energy production and consumption.

This report was commissioned to begin bridging this gap, especially for the Least Developed Countries (LDCs) and sub-Saharan Africa, where energy access is especially constrained. In addition to compiling statistics from countries on access to electricity and modern fuels, as well as drawing on the forthcoming WHO Household Energy database and the International Energy Agency's *World Energy Outlook 2009*, this report supplements existing global reports with available statistics (which, in some cases, are sorely lacking) on fuel types, improved stoves used for cooking, and mechanical power. It summarises as well the latest evidence on the health impacts attributable to indoor air pollution resulting from household use of solid fuels for cooking and heating. It also estimates the number of additional people that would have to gain access to modern energy services by 2015 under different scenarios, including scenarios that are compatible with meeting national targets and the MDGs and are disaggregated for LDCs and sub-Saharan Africa.

We believe that this report paints a relevant and timely picture of the global energy access situation and their health and development implications for developing countries. Much more still needs to be done for a more fulsome understanding, including further disaggregating data and supplementing them with qualitative information. Paying particular attention to issues such as fuel types, end-use equipment, gender, and rural and remote areas will go a long way to influencing policy and strengthening efforts by the international community and national governments to address the challenge of energy poverty.

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ABBREVIATIONS AND ACRONYMS

AQGs	Air Quality Guidelines
BoD	Burden of Disease
CEMAC	Economic and Monetary Community of Central Africa
CO	Carbon monoxide
COPD	Chronic Obstructive Pulmonary Disease
DALY	Disability-Adjusted Life Year
DC	Developing Country
EAC	East African Community
EAP	East Asia and the Pacific
ECOWAS	Economic Community of West African States
FEMA	Forum of Energy Ministers of Africa
GTZ	*Gesellschaft für Technische Zusammenarbeit* (German Agency for Technical Cooperation)
HDI	Human Development Index
ICS	Improved Cooking Stove
IEA	International Energy Agency
IMF	International Monetary Fund
LAC	Latin America and the Caribbean
LDC	Least Developed Country
LPG	Liquefied Petroleum Gas
MDG	Millennium Development Goals
MDGR	Millennium Development Goals Report
OECD	Organization for Economic Co-operation and Development
PM10	Particulate Matter with an aerodynamic diameter of 10 micrometers
PRSP	Poverty Reduction Strategy Paper
SADC	Southern African Development Community
SFU	Solid Fuel Use
SSA	Sub-Saharan Africa
UN	United Nations
UNICEF	United Nations Children's Fund
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

Expanding access to modern energy services is an enormous challenge for developing countries, especially in the poorest countries. This report takes stock of the current energy access situation in developing countries. It covers a range of energy access data available from developing countries that is not currently accessible in one report and, at the same time, is also often neglected in global energy discussions. A broad range of energy access data is critical not only to understand countries' energy access situation but also for developing policies and programmes that address energy poverty and for financing the expansion of access to modern energy services.

This report is aimed at drawing attention to the energy access situation beyond the conventional focus on electricity, especially in poorer developing countries where access is the most constrained. It also raises some issues related to the availability of statistical data on energy access. The report specifically draws attention to the:

- Energy access situation in LDCs and sub-Saharan Africa, including access to electricity and modern fuels,
- Fuels and improved stoves used for cooking in developing countries,
- Health impacts attributable to indoor air pollution from household use of solid fuels for cooking and heating,
- Developing countries with modern energy access targets, and
- Energy access situation in 2015 under different scenarios, to estimate the progress in energy access that will be needed for the achievement of the Millennium Development Goals (MDGs).

The main findings are as follows:

Currently, about 1.5 billion people in developing countries lack access to electricity and about 3 billion people rely on solid fuels for cooking. In sub-Saharan Africa, the number of people without access to electricity and modern fuels is similar (respectively 560 and 625 million people). In Asian regions, while people may have access to electricity, they often lack access to modern fuels. In East Asia and Pacific, less than 200 million people lack electricity access, but almost 1.1 billion people rely on solid fuels for cooking.

Although energy access varies widely across developing countries, it is much lower in poorer developing countries than in other developing countries, placing poorer countries at a huge disadvantage. Seventy-nine percent of people lack access to electricity in the LDCs and 74 percent in sub-Saharan Africa, compared to 28 percent of those in developing countries as a whole. Access to modern fuels is equally constrained in LDCs and sub-Saharan Africa, where 91 percent and 83 percent, respectively, lack access to modern fuels.

Modern fuels and improved stoves to meet people's most basic cooking needs are out of the reach of the majority of people living in developing countries, especially for those in rural areas. Fifty-six percent of people in developing countries rely primarily on solid fuels—coal and traditional biomass—for their cooking needs, with little or no access to more efficient, modern forms of energy. Their access to improved cooking stoves is also very limited. Only 27 percent of those who rely on solid fuels—roughly 800 million people—are estimated to use improved cooking stoves. Access to improved cooking stoves is even more limited in LDCs and sub-Saharan Africa, where only 6 percent of those who use traditional biomass are using such options. Traditional biomass such as wood, charcoal, and dung is much more commonly used in rural areas

than urban areas. Some 71 percent of people living in rural areas use traditional biomass, primarily wood, for cooking, while 70 percent of those living in urban areas rely on modern fuels, especially gas.

Worldwide almost two million deaths annually from pneumonia, chronic lung disease, and lung cancer are associated with exposure to indoor air pollution resulting from cooking with biomass and coal, and 99 percent of them occur in developing countries. Almost half the global population (45 percent) still relies on solid fuels for household use, resulting in dramatic impacts on health, especially for children and women. Some 44 percent of these deaths occur in children; of the adult deaths, 60 percent occur in women in developing countries. In LDCs and sub-Saharan Africa, more than 50 percent of all deaths from these three diseases can be attributed to solid fuel use, compared with 38 percent in developing countries overall. Given the high burden of these diseases in LDCs and sub-Saharan Africa, household energy interventions clearly have considerable potential to improve health and promote achievement of MDGs, particularly MDG-4 on child survival.

Emissions from burning solid fuels in open fires and traditional stoves also have significant global warming effects, due to incomplete combustion of fuel carbon. Consequently, interventions that improve combustion efficiency and hence reduce emissions and exposure to pollutants can benefit health and mitigate climate change. The impacts on mitigating climate change open up possibilities for using carbon finance to help reduce the costs to the poor of accessing clean and efficient household energy services.

The number of countries with targets in place for improving access to modern energy is still limited, especially for energy needs that are most critical for reducing poverty. About half of developing countries now have targets for improving access to electricity. In contrast, few countries have targets for modern fuels, improved cooking stoves, or mechanical power, all crucial for meeting the basic needs of poor men and women. Among the countries making progress in establishing energy access targets are those in sub-Saharan Africa, where regional organisations have encouraged countries to adopt such targets.

Developing countries are far behind in expanding access to modern energy, whether to meet nationally-set energy access targets or facilitate achievement of the Millennium Development Goals. Given current energy access levels, it is clear that levels compatible with reaching the Millennium Development Goals will not be met in almost all LDCs and sub-Saharan African countries. To meet the goal of halving the proportion of people living in poverty, almost 1.2 billion additional people will need access to electricity and 1.9 billion people will need access to modern fuels by 2015, according to estimates prepared for this report. Similarly, to meet targets set by national governments, almost 1.2 billion additional people will need access to electricity by 2015.

Continued efforts are required to improve the quantity and quality of statistical information related to energy access, as a basis for designing policies and programmes to address energy poverty challenges. For most countries, statistical data on access to electricity and modern fuels (or conversely reliance on solid fuels) are relatively available and accessible, although there are issues of data consistency with other sources. More information is needed to improve understanding of what type of energy carriers and end-uses are utilised, who uses them, how much they cost, and how much they deliver in terms of benefits, especially for poor men and women. Particularly noteworthy is the lack of data available on improved cooking stoves (73 of 140 countries lack data) and mechanical power (137 of 140 countries lack data).

Greater broad-based efforts are needed to expand access to modern energy services to those who lack access, especially to heat for cooking and to mechanical power in rural and remote areas. Setting targets is a necessary step to provide a framework for tracking progress and accountability. These targets must be part of viable energy access strategies, backed by appropriate priorities, policies and programmes, and financial resources, if they are to be realised. Unless massive efforts are made to expand the range, quality, and quantity of energy services available to the poor, countries are unlikely to achieve their development aspirations.

I. PURPOSE

Energy deeply influences people's lives. It is central to practically all aspects of human welfare, including access to water, agricultural productivity, health care, education, job creation, climate change, and environmental sustainability. Yet, millions of households in developing countries still lack access to modern energy services that are affordable, clean, reliable, and safe, and pay high prices for poor-quality substitutes. This situation entrenches poverty, damages health, constrains delivery of local services, increases vulnerability to climate change, limits expansion of opportunities, erodes environmental sustainability at the local, national, and global levels, and creates negative impacts on education and health.[1]

This study was commissioned to map the energy access situation in developing countries, with a focus on the Least Developed Countries (LDCs) and sub-Saharan Africa (SSA), which have the lowest levels of access to modern energy services. An extensive search of current publicly available data was conducted via the Internet for all developing countries. The search focused on the more commonly available data on access to electricity and modern fuels, but also on data that tend to be less prominent—mechanical power and improved stoves used for cooking. Over 500 relevant documents were found and reviewed.[2]

The primary motivation behind the study was to create a 'catch-all' document for the array of energy access data available from developing countries, which has yet to be made accessible in a single publication. The intent is to provide a global picture of the energy access situation in developing countries in an accessible fashion for ease of reference. While the report ultimately draws attention to the prevailing energy access situation and gaps in energy access data, it may also be useful for policy makers and development practitioners as they develop policy and programmatic responses to energy poverty challenges.

To complement existing information on energy access from the International Energy Agency (IEA), the World Health Organization (WHO), and other organisations, this report compiles existing country-level data and aggregates the data with a focus on the following:

- **The energy access situation in LDCs and sub-Saharan Africa.** The energy access situation is severest in these countries and available data are rarely aggregated for LDCs. This part focuses on access to electricity and modern cooking fuels, including for rural and urban areas, and aggregated for LDCs and sub-Saharan Africa.
- **Fuels and improved stoves used for cooking.** Statistics on the number of people using different types of fuels for cooking and improved cooking stoves are for the first time compiled into one database administered by WHO.[3] This study estimates for the first time the proportion of people in developing countries using different types of fuels for cooking as well as improved cooking stoves.
- **The health impacts attributable to indoor air pollution from solid fuel use.** People relying on solid fuels—traditional biomass and coal—for cooking are exposed to various pollutants that create a large burden of disease in the form of pneumonia, chronic obstructive pulmonary diseases, and lung cancer.

[1] See Appendix 1 for an illustration of the relationship between energy access and development indicators.

[2] See Appendix 7 for a comprehensive listing of sources consulted.

[3] WHO Household Energy database, World Health Organization, Geneva, 2009.

- **National targets on modern energy access.** Past reviews by UNDP of poverty reduction strategies and national MDG reports showed that countries' commitments to expanding access to energy services vary significantly.[4] As a follow-up to these studies, this report attempts to map out countries' commitments as expressed in nationally agreed energy access targets. It focuses on targets for access to electricity, modern fuels, improved cooking stoves, and mechanical power for rural productive uses.
- **Additional number of people with modern-energy access in 2015 under different scenarios.** This report estimates the number of additional people that will gain access to electricity and modern cooking fuels in 2015 under three different scenarios: Base Case Scenario, National Energy Access Targets-Compatible Scenario, and MDG-Compatible Scenario. While the IEA has developed similar scenarios, those in this report are disaggregated for LDCs and sub-Saharan Africa.

[4] See the reports *A Review of Energy in National MDG Reports (UNDP 2007a) and Energizing Poverty Reduction A Review of the Energy-Poverty Nexus in Poverty Reduction Strategy Papers* (UNDP 2007b).

II. METHODOLOGY

A. Data collection

This report is based mainly on current, publicly accessible documents, as well as energy access data made available by IEA and WHO. Over 500 documents in English, French, or Spanish were found, providing statistical data on energy access for countries.[5] In addition, some data were collected through requests and personal communications with relevant organisations.[6]

Data on energy access were collected for all 140 countries defined as developing countries by UNDP (2007c). Fifty of these countries were considered to be LDCs according to the UN's classification system (UN 2007) as of early 2007. Thirty-one of the LDCs are located in sub-Saharan Africa.[7]

The following procedure was used to decide which data to use when competing data were found:

- Where possible, international databases using a common methodology were used, such as the WHO-sponsored World Health Surveys, the USAID-sponsored Demographic and Health Surveys, and the UNICEF-sponsored Multiple Indicators Cluster Surveys. For electricity access, country data reported in the IEA database on electricity access featured in the *World Energy Outlook 2009*[8] were used.
- When country data were not available from international databases, national statistical sources were searched. Data were obtained from statistical surveys, such as Living Condition Surveys, Household Income and Expenditure Surveys, Social and Living Standards Measurement Surveys, and censuses.[9]
- Where country data were not available from international or national statistical sources, data were obtained from government websites, policy documents, and other reports. A few policy and MDG-related documents also provide statistics on improved cooking stoves and mechanical power.

Information *on energy access targets* was also collected and was obtained from Poverty Reduction Strategy Papers (PRSPs), MDG reports, national planning documents, sectoral master plans and policy documents, and global and regional review documents.[10]

B. Indicators used to measure energy access

Statistics were gathered on indicators of access to modern forms of energy—electricity, modern fuels, and mechanical power[11]—as described below:

[11] In its *World Energy Outlook* (2006 and 2009), IEA produced global and regional estimates of access to electricity as well as reliance on traditional fuels for developing countries as defined by the OECD. However, the estimates provided in this report are based on the UNDP classification of developing countries. In Fuels for Life (2006), WHO produced an estimate of the worldwide use of solid fuels for cooking, broken out by WHO regions, which are different than the regional groupings used in this report.

[5] The country data are available in tabular form in Appendix 6 and a comprehensive listing of sources consulted in Appendix 7.

[6] Some data relative to Demographic and Health Surveys were obtained via personal communication from Alexander T. Izmukhambetov, MEASURE DHS, Macro International Inc., 2008-09. Some data relative to Multiple Indicator Cluster Surveys (MICS) were obtained via personal communication from Ngagne Diakhate, UNICEF, New York, 2008-09.

[7] A list of developing countries and their regional classifications is provided in Appendix 2.

[8] *World Energy Outlook 2009* (OECD/IEA 2009).

[9] Data on improved cooking stoves were rarely available from national statistical agencies and were primarily collected from World Health Surveys and Multiple Indicators Cluster Surveys.

[10] Targets may also be in place for improving energy access at a sub-national, localised level. For instance, Cape Verde aims to bring electricity to 10 rural localities each year (IMF 2006), and Guinea plans to equip 500 large villages with multi-functional platforms by 2015 (UNDP 2006). These targets were not included in this study.

- **Access to electricity**, measured as the percent of people that have a household electricity connection. The electricity connection may vary by quantity (e.g., hours of availability in a day), quality (e.g., rated voltage and frequency), and use (e.g., light bulb to a wide range of end-uses).
- **Access to modern fuels**, measured as the percent of people that use electricity, liquid fuels, or gaseous fuels as their primary fuel to satisfy their cooking needs. These fuels include liquefied petroleum gas (LPG), natural gas, kerosene (including paraffin), ethanol, and biofuels, but exclude all traditional biomass (e.g., firewood, charcoal, dung, and crop residues) and coal (including coal dust and lignite).[12] Access to modern fuels is also needed for heating. In most cases, populations without access to modern fuels for cooking also rely on solid fuels for heating. However, available data refer mainly to fuels used for cooking.
- **Access to mechanical power**, measured as the percent of people that use mechanical power for productive, non-industrial applications, such as water pumping, agricultural mechanisation, and small-scale agro processing (e.g., grinding, milling). It refers to the transmission of energy through a solid structure to impart motion, such as for pumping, pushing, and other similar needs, and is obtained from energy carriers (e.g., electricity, modern fuels, traditional biomass) or energy sources transmitted directly (e.g., wind, hydroelectric power).[13]

To better understand energy-related cooking practices, data were also collected on improved cooking stoves and the different types of fuels used for cooking. These are described as follows:

- **Access to improved cooking stoves**, measured as the percent of people relying on solid fuels—traditional biomass and coal—that use improved stoves for their cooking needs.[14] This category includes closed stoves with chimney, as well as open stoves or fires with chimney or hood, but excludes open stoves or fire with no chimney or hood. Stoves that use electricity, liquid fuels, or gaseous fuels are not included.
- **Access to cooking fuels**, measured as the percent of people that use different types of cooking fuels as their primary cooking fuel, including both modern and solid forms of energy.[15] The types of cooking fuels for which data are available and were collected are:
  - Electricity
  - Gas, including LPG, natural gas, and biogas
  - Kerosene, including paraffin
  - Charcoal, including char-briquettes
  - Coal, including coal dust and lignite
  - Wood, including wood chips, straw, shrub, grass, and crop and agricultural residues
  - Dung

For this report, energy access is defined broadly to encompass access to various forms of modern energy as described above. However, in reality the scope of 'energy access' can be much more complex and nuanced, as described in Box 1.

[12] The terms 'traditional' and 'modern' are used here because they are widely used in the literature. However, traditional biomass can be transformed into modern biomass, where more efficient end-use technology is used.

[13] Only three countries—Benin, Central African Republic, and Mali—provide estimates of access to mechanical power and these are for rural areas only.

[14] REN21, in its report *Renewables 2007 Global Status Report* (2007), estimated the number of improved cooking stoves disseminated, while the measure used in this study is the population relying on improved cooking stoves in use.

[15] FAO produced a number of studies on fuelwood statistics, especially for Africa and Asia. See, for instance, *Wood Energy Information in Africa* (2001).

Box 1. Additional factors relevant to energy access

Understanding what type of energy carriers and end uses are available, who uses them, how much they cost, and the benefits they provide to users, are factors to consider when assessing energy access. For instance, energy access can include measures related to:

The quality and quantity of energy provided. Statistical data regularly collected by statistical agencies generally do not provide detailed data on the quantity (e.g., hours of use/availability) and quality (e.g., rated voltage and frequency) of the energy services provided, although these may be available from utilities and other sources.

Energy end-use appliances and equipment and the services they provide. Data on the availability of certain household and agricultural equipment—lighting using different energy sources, water pumps, refrigerators, and different types of stoves—are available from some international surveys, and would be useful to collect, but were beyond the scope of this report.

Socioeconomic profile of energy users and energy affordability. Data on income levels and geographical location of energy users are often available from statistical agencies, but other socioeconomic data on users—prices of energy services, gender-disaggregated data, disaggregation for key sectors such as businesses, schools, and health centres—may not be.

C. Methods used to estimate energy access

Data were sought, but not always found, for all developing countries. As a result, certain estimations were made, as described below.

Estimates of energy access. For electricity access, the year 2008 was chosen as the base year, as most of the data are from the *World Energy Outlook 2009*,[16] which references electrification rates for 2008 (or the latest year available). Data relating to access to modern fuels, mechanical power, and improved cooking stoves were collected for 2007. Where these data were unavailable, data for the year closest to 2007 were used to produce an estimate of access in 2007, using population data for 2007 obtained from the UN Population Division.

Data collected on access to electricity ranged from 2000 to 2008. For cooking fuels, data ranged from 1996 to 2008; for improved cooking stoves, data ranged from 2003 to 2007; and for mechanical power, data ranged from 2000 to 2005.

Data were sought for energy access at the national, urban, and rural levels. Where data were available for two of the three, estimates were made for the third using the available information. When the access rate at the national level was 97 percent or greater, then access was assumed to be 100 percent in urban areas.

Estimates of global and regional energy access. Where data from some countries were missing, estimates of global and regional energy access for developing countries were produced using a simple extrapolation process. The extrapolation involved aggregating the data from countries for which data

[8] *World Energy Outlook 2009* (OECD/IEA 2009).

were available, and assuming that the level of access is the same in countries without data.[17] This was done only where data represented at least 75 percent of the relevant population. In cases where the data represented fewer than 75 percent of the population, global or regional estimates were generally not produced.[18] The exception is improved cooking stoves, where some regional estimates are based on data representing less than 75 percent of the population. Global or regional estimates could not be produced for mechanical power, since data were found for only three countries.

Estimates of energy access in 2015 under different scenarios. The target year of 2015 was selected because it is the year established by intergovernmental agreement for achieving the MDGs. The scenarios created for this report take into account population increases as estimated by the UN Population Division. To produce scenarios based on meeting national energy access targets, information on such targets was collected at the country level (see Appendix 6).

The scenarios assume that progress towards energy access targets occurs at a constant, linear rate between 2007 and 2015. This is necessary because not all country targets are pegged to the year 2015. Where current access is 97 percent or more, it was assumed that there will be full access in 2015. For national targets of 90 percent or more, full access in urban areas was assumed.

The country targets for electricity access were pegged to years ranging from 2010 to 2027. For access to modern fuels, the target years ranged from 2010 to 2030, and for access to improved cooking stoves, the target years ranged from 2010 to 2017. For access to mechanical power, all targets were pegged to 2015.

D. Considerations in using and interpreting estimates

As noted, this report compiles publicly available statistical data from a wide variety of sources. Therefore, statistical data collected on energy access may not be directly comparable from one country to another.

First, within a country, different estimates may exist for the same indicator. While every effort was made to use country data that were collected from multi-country databases that use a similar methodology, this was not always possible (see section II.A for an explanation of the process used to select data available from different sources).

Second, the data collected from national governments are based on the country's own definitions, methods, and coverage, which may differ from country to country. For instance, definitions of what constitutes a rural or urban area may differ; data from national surveys will depend on the sample selection; data from national utilities do not include illegal connections, but data from surveys may include them; and some data are based on the proportion of households with energy access, while others reference the proportion of the *population* with access.

E. Method used to assess the health impacts of solid fuel use

The amount of disease that results from the widespread use of solid fuels has been determined as part of the Global Burden of Disease Project (WHO 2009a). This burden is expressed in two main ways, first as 'Premature Deaths' (commonly referred as deaths in this publication), and second as 'Disability Adjusted Life

[17] Another possible method is regression analysis, which is used by the IEA (2006) and relies on available data to model trends.

[18] For information on the proportion of the population represented by available data, see Appendix 6.

Years' (DALYs). DALYs combine (i) the years of life lost as a result of premature death and (ii) the years lived with a disease, which are adjusted using an internationally agreed system of 'disability' weights. For example, for an acute condition, such as child pneumonia, the majority of the DALYs result from years of life lost due to death in childhood, while for a chronic disease, such as chronic obstructive pulmonary disease (COPD), the years lived with illness are more important. For lung cancer, the situation is intermediate, as the years lived with illness are relatively short due to the very poor survival with this disease.

Burden of disease is calculated by first combining information on the increased (or relative) risk[19] of a disease resulting from exposure, with information on how widespread the exposure is in the population (in this case, the percentage of people using solid fuels). This allows calculation of the 'population attributable fraction' (PAF), which is the fraction of the disease seen in a given population that can be attributed to the exposure, in this case solid fuel use. Applying this fraction to the total burden of disease (e.g., child pneumonia expressed as deaths or DALYs), gives the total number of deaths or DALYs that result from use of solid fuels. These calculations have also allowed for the fact that in some countries (for example, China) a substantial proportion of the population use improved chimney stoves which reduce but do not eliminate smoke exposure, although—as will be shown in Chapter IV—only a small minority of the poorest developing country households have access to improved stoves.

A detailed description of the methods mentioned above has been published elsewhere (WHO 2004a, 2004b). The deaths and DALYs figures presented in this report have been computed by WHO to ensure compatibility; thus they do not necessarily reflect the official statistics of the countries, which may use alternative rigourous methods. Also, using methodology currently recommended by the Global Burden of Disease Project,[20] the number of deaths and DALYs attributable to indoor air pollution from solid fuel use were calculated without the prior removal of chronic obstructive pulmonary disease and lung cancer deaths and DALYs attributable to smoking, and therefore lead to higher figures than previously reported (WHO 2002, 2004a, and 2006).

[19] The 'relative risk' indicates how much more likely it is that a person will get the disease if exposed to smoke from solid fuel use, compared with someone who is not.

[20] Recent epidemiological evidence shows that the method used previously (excluding the deaths attributable to smoking) was too conservative.

III. ENERGY ACCESS SITUATION IN LDCS AND SUB-SAHARAN AFRICA

A. Access to electricity

Almost all developing countries have data on access to electricity. Data were found for 136 of 140 developing countries (all except for the Bahamas, Cyprus, Somalia, and Tokelau), accounting for some 99.8 percent of the total population of developing countries (Table 1).

Table 1. Number of countries with data available on access to electricity

	Total no. of countries	Access to electricity	
		No. of countries with data available	% of population represented by the data available[1]
Developing countries	140	136	99.8
LDCs	50	49	98.9
Sub-Saharan Africa	45	45	100.0

[1] Percent of the population of the reporting countries out of the total population.
Notes: Availability as of October 2009, as determined by authors' desk study. Based on UNDP's classification of developing countries and the UN's classification of LDCs (see Appendix 2 for a list of countries).

Some 1.5 billion people in developing countries lack access to electricity. According to the *World Energy Outlook 2009* (OECD/IEA 2009), almost 100 percent of people in OECD and transition economies have access to electricity, while only 72 percent of people in developing countries have access (Table 2).

Table 2. Access to electricity in the world, 2008

	Total population (in millions)	Electrification rates (%)	Total population without electricity (in millions)
World	6,692	78.2	1,456
OECD and transition economies	1,507	99.8	3
Developing countries	5,185	72	1,453

Source: *World Energy Outlook 2009* (OECD/IEA 2009).
Notes: The IEA estimates are based on a different system of regional classification than the UNDP classification system used for this report.

A significant number of people without access to electricity live in the Least Developed Countries (LDCs) and sub-Saharan Africa. This report estimates that some 630 million lack access in the LDCs, while more than 560 million lack access in sub-Saharan Africa (Table 3).

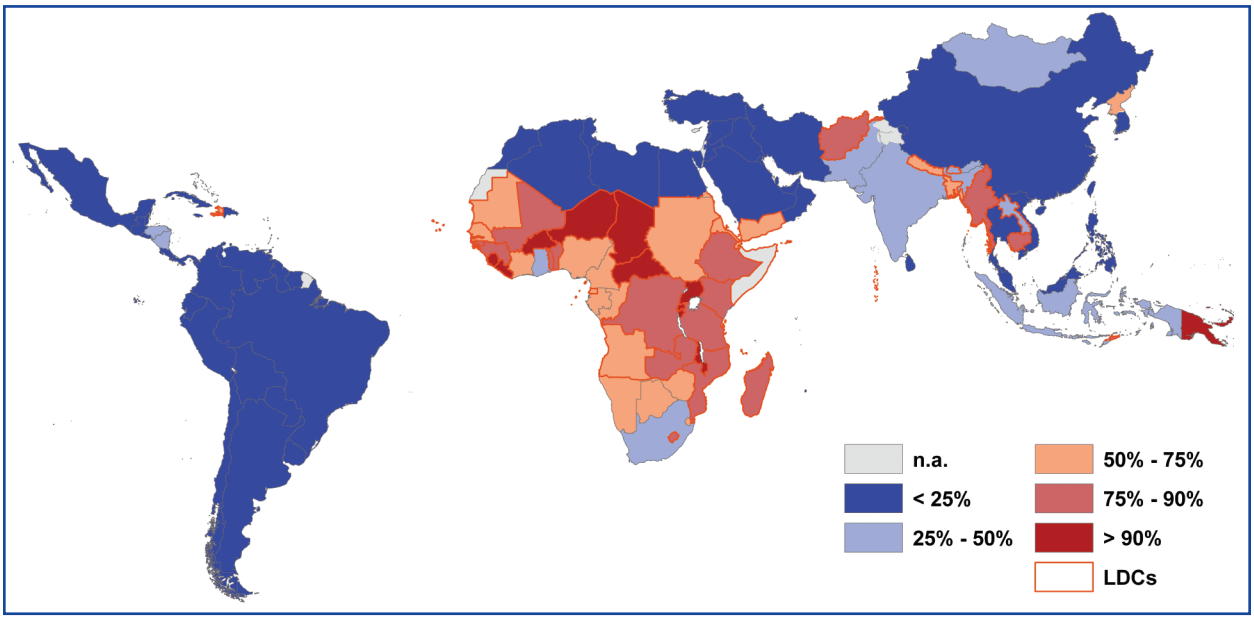
Table 3. Number of people without electricity access in LDCs and SSA, 2008

	Total population (in millions)	Electrification rates (%)	No. of people without electricity access (in millions)
LDCs	824	21	635
Sub-Saharan Africa	777	26	561

Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, with 31 countries belonging to both categories (see Appendix 2 for a list of countries).

The share of people lacking access to electricity differs significantly across regions, but is much greater in the LDCs and sub-Saharan Africa than in other countries (Map 1). As indicated in Table 3, the LDCs and sub-Saharan Africa have a lower share of people with access (21 percent and 26 percent, respectively) than developing countries generally (72 percent with access).

Map 1. Share of people without electricity access for developing countries, 2008



N.A. = not available.

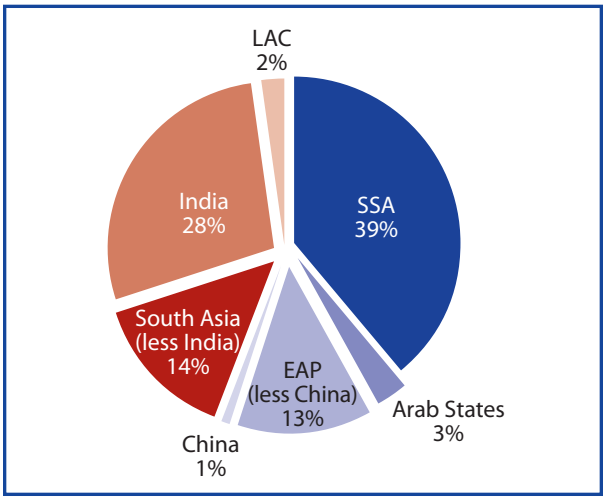
Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. Some of the small countries and island states are not visible in the map. For a complete list of countries, see Appendix 2. The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations or UNDP concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

More than 80 percent of people without electricity access live either in sub-Saharan Africa or in South Asia (Figure 1). While sub-Saharan Africa makes up about 14 percent of the total population of developing countries, it accounts for almost 40 percent of the population without electricity access.

Access to electricity also varies dramatically among countries in the same region (Map 1/ Figure 2). For instance, in Latin America and the Caribbean, 62 percent lack access in Haiti, but only 2 percent lack access in Brazil. In sub-Saharan African countries such as Chad, Liberia, and Burundi, more than 95 percent of people lack electricity access, while 25 percent do in South Africa, and less than 1 percent do in Mauritius.

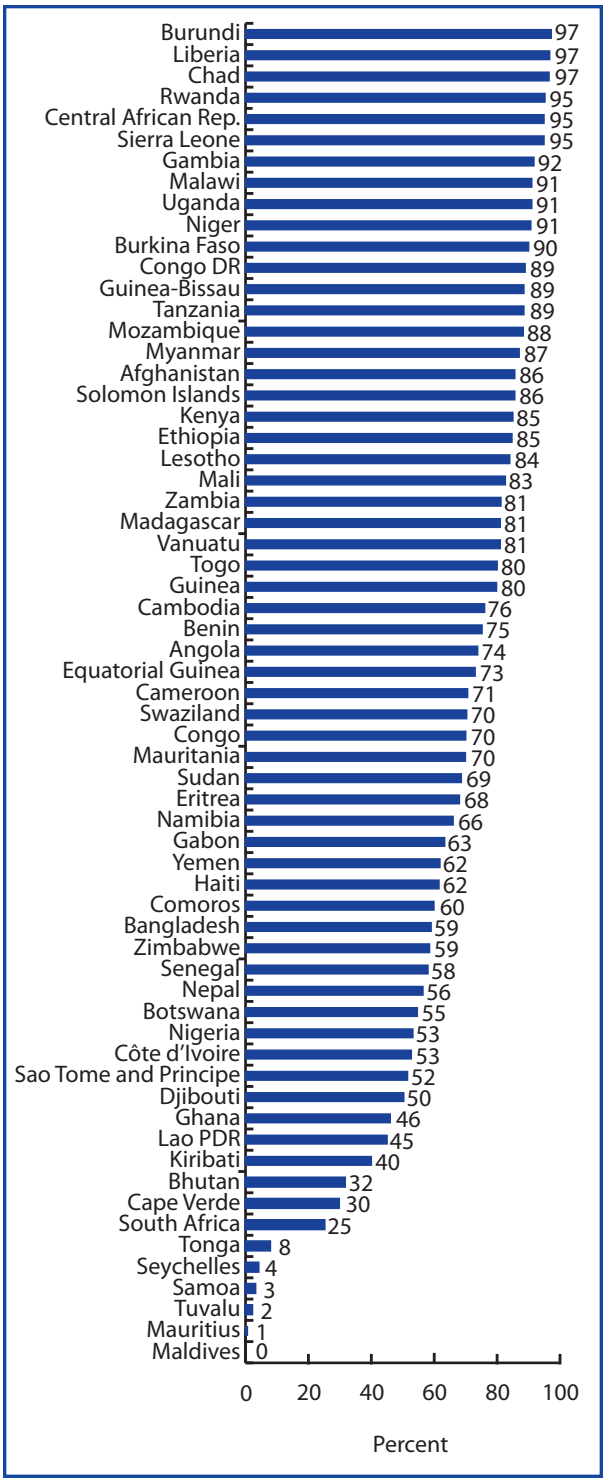
In rural areas of the developing countries, access to electricity is considerably lower than in urban areas (Figure 3). The problem is much more severe in rural areas of LDCs and sub-Saharan Africa (87 percent and 89 percent, respectively, lack access) than in developing countries in general (41 percent lack access).

Figure 1. Distribution of people without electricity access by developing regions, 2008



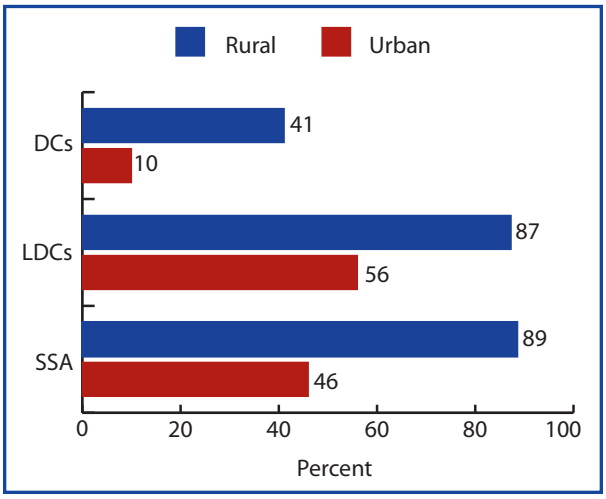
Note: DC regions based on UNDP's classification of countries.

Figure 2. Share of population without electricity access for LDCs and SSA countries, 2008



Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, with 31 countries belonging to both categories (see Appendix 2 for a list of countries).

Figure 3. Share of population without electricity access in rural and urban areas for LDCs and SSA, 2008



Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, with 31 countries belonging to both categories (see Appendix 2 for a list of countries).

However, even among urban populations, lack of access to electricity is a significant problem for LDCs and sub-Saharan Africa, where about 46 percent and 56 percent of urban dwellers, respectively, lack access, compared with only 10 percent lacking access in developing countries generally.

B. Access to modern fuels

Some 129 countries have data on access to modern fuels (see Table 4). The term modern fuels refers to electricity, liquid fuels (such as kerosene), and gaseous fuels (such as liquefied petroleum gas (LPG), natural gas), and excludes traditional biomass and coal.

Table 4. Number of countries with data available on access to modern fuels

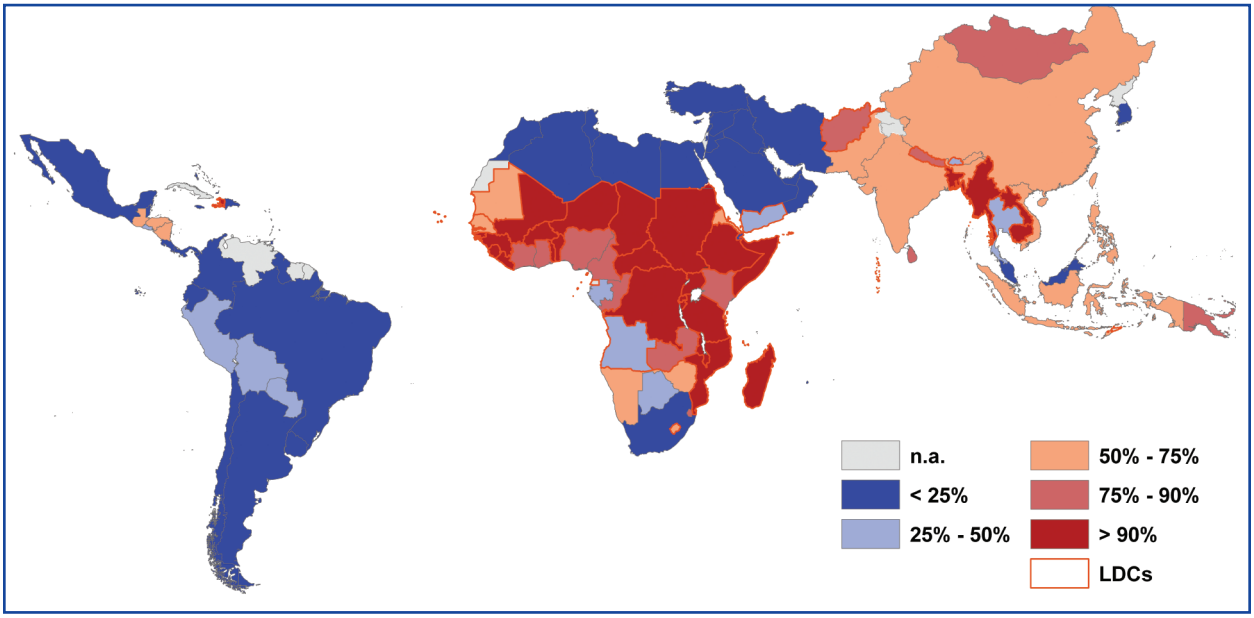
	Total no. of countries	Access to modern fuels	
		No. of countries with data available	% of population represented by the data available[1]
Developing countries	140	129	98.8
LDCs	50	46	99.8
Sub-Saharan Africa	45	43	99.9

[1] Percent of the population of the reporting countries out of the total population.

Notes: Availability as of October 2009, as determined by authors' desk study. Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Modern fuels refer to electricity, liquid fuels, and gaseous fuels, such as LPG, natural gas, and kerosene.

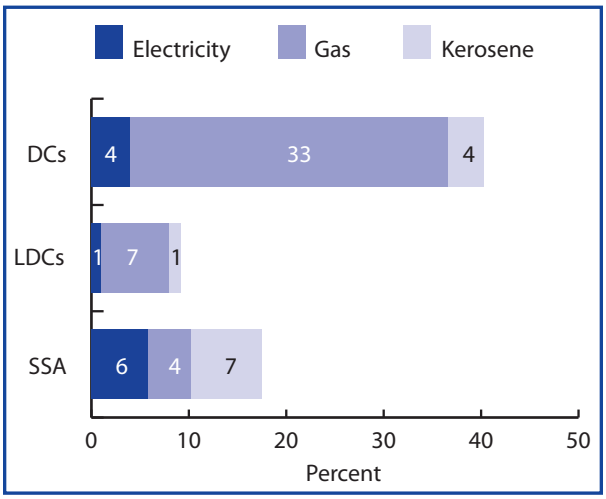
Developing regions differ widely with respect to access to modern fuels, but access is more limited in the Least Developed Countries (LDCs) and sub-Saharan Africa (Map 2). In developing countries overall, more than 40 percent of people rely on modern fuels; however, in LDCs and sub-Saharan Africa, only 9 percent and 17 percent, respectively, have access to modern fuels. Almost one-third of the population in developing countries overall uses gas (mostly LPG), but less than 10 percent of people in LDCs and sub-Saharan Africa have access to gas (Figure 4).

Map 2. Share of population without access to modern fuels for developing countries, 2007



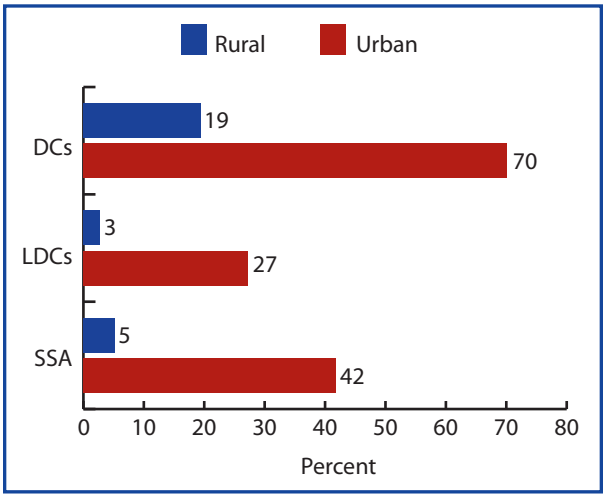
Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. Some of the small countries and island states are not visible in the map. For a complete list of countries, see Appendix 2. Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas, and kerosene. The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations or UNDP concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

Figure 4. Share of population with access to different types of modern fuels in LDCs and SSA, 2007



Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries).

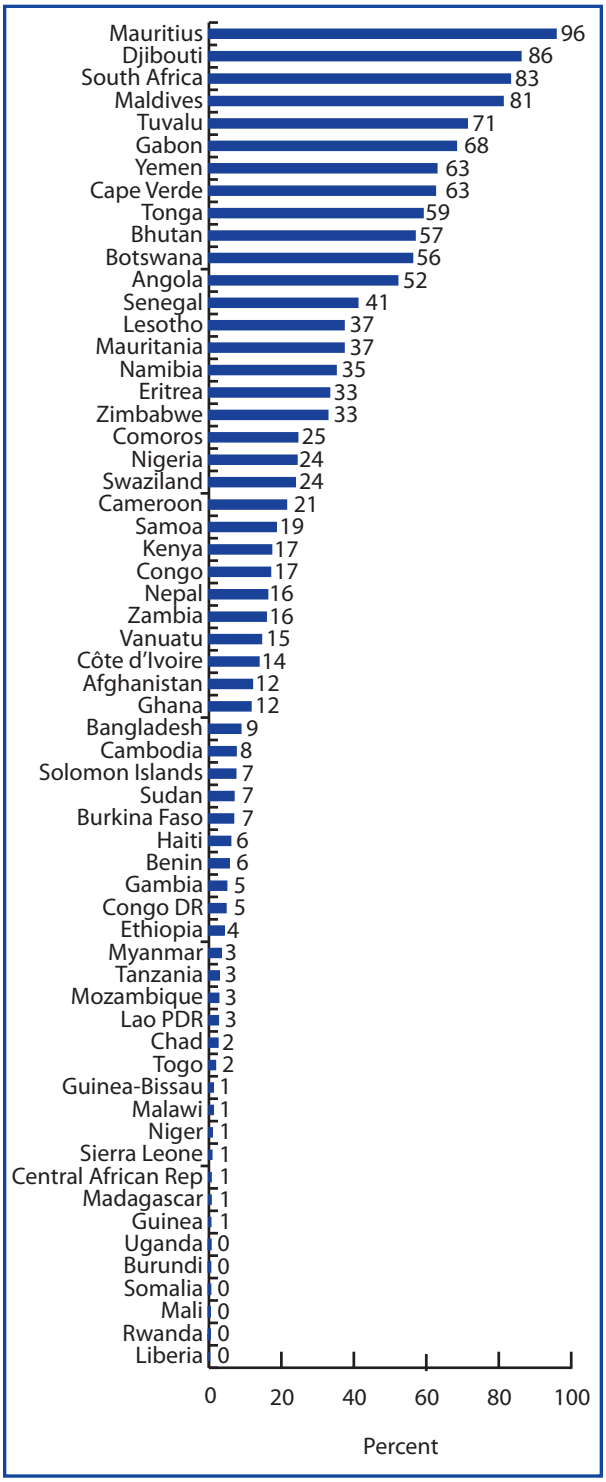
Figure 5. Share of population with access to modern fuels in rural and urban areas of LDCs and SSA, 2007



Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas, and kerosene.

Access to modern fuels for cooking also varies dramatically among developing countries in the same region (Map 2/Figure 6). For instance, in the Asia-Pacific region, less than 10 percent of people in Bangladesh have access to modern fuels, but

Figure 6. Share of population with access to modern fuels in LDCs and SSA countries, 2007



Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas, and kerosene.

access is almost universal in Malaysia. In sub-Saharan Africa, less than 1 percent of people in Burundi, Liberia, Mali, Rwanda, Somalia, or Uganda have access to modern fuels, but 83 percent of people in South Africa have access.

There is a large gap between access to modern fuels in rural and urban areas of developing countries (Figure 5). While about 70 percent of urban people in developing countries overall rely on modern fuels as primary cooking fuels, only about 19 percent of rural people use modern fuels as a their primary fuel. In LDCs and sub-Saharan Africa, rural access to modern fuels is even lower, at 3 percent and 5 percent, respectively. Even in urban areas of LDCs and sub-Saharan Africa, most people still lack access to modern fuels (27 percent and 42 percent, respectively, have access).

IV. FUELS AND IMPROVED STOVES USED FOR COOKING IN DEVELOPING COUNTRIES

A. Fuels used for cooking

In developing countries, 3 billion people rely on solid fuels—traditional biomass and coal—to meet their cooking needs. Around 2.6 billion rely on traditional biomass, while 400 million use coal as their primary cooking fuel. Over 700 million people without access to modern fuels for cooking live in the Least Developed Countries (LDCs) and over 600 million in sub-Saharan Africa (Table 5).

Table 5. Number of people relying on solid and modern fuels for cooking for LDCs and SSA, 2007

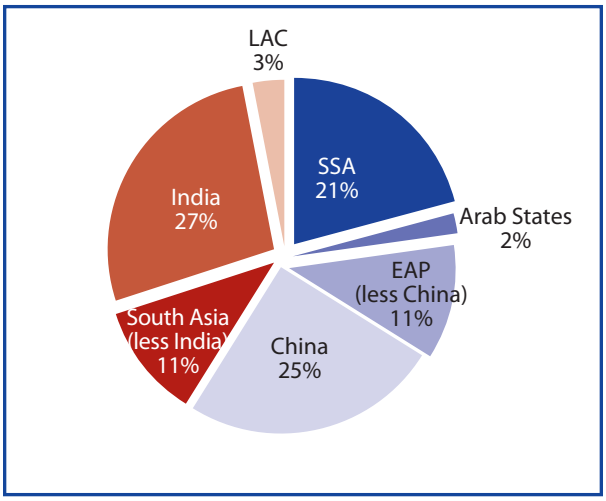
	No. of people relying on solid fuels (in millions)			No. of people with access to modern fuels (in millions)
	Traditional biomass	Coal	Total	
Developing countries	2,564	436	2,999	2,294
LDCs	703	12	715	74
Sub-Saharan Africa	615	6	621	132

Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, with 31 countries belonging to both categories (see Appendix 2 for a list of countries). Traditional biomass includes wood, charcoal, and dung. Wood includes wood, wood chips, straw, and crop residues. Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas, and kerosene. For information on developing-region populations, see Appendix 6.

The vast majority of people who rely on solid fuels for cooking are concentrated in Asia and sub-Saharan Africa. As shown in Figure 7, almost three-quarters of those who rely on solid fuels for cooking live in Asia, with India and China accounting for 27 percent and 25 percent, respectively, of all those using solid fuels for cooking. While sub-Saharan Africa makes up 14 percent of the total population of developing countries, it accounts for more than 20 percent of people relying on solid fuels as their primary cooking fuel.

The share of population relying on wood as a cooking fuel is highest in sub-Saharan Africa and South Asia. As shown in Figure 8, almost 70 percent of people in sub-Saharan Africa rely on wood (and its by-products) as primary cooking fuel. In India, some 58 percent rely on wood, as do 49 percent of people in the rest of South Asia. The reliance on solid fuels in sub-Saharan Africa (82 percent) is higher than any other geographic region.

Figure 7. Distribution of people relying on solid fuels for cooking by developing regions, 2007



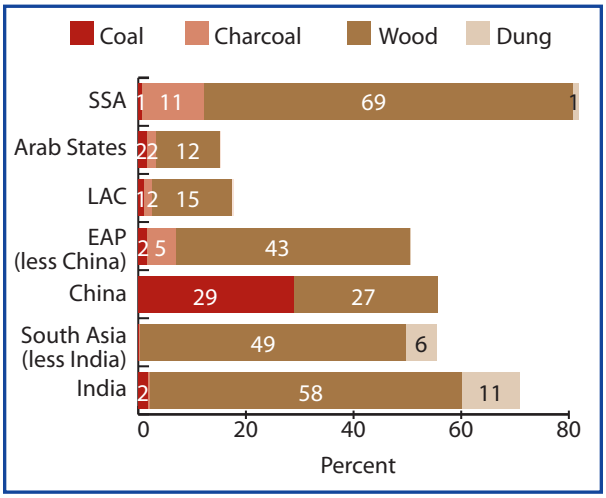
Note: DC regions based on UNDP's classification of countries.

Fewer people rely on charcoal, coal, and dung as primary cooking fuels, and the use of these fuels is concentrated in certain countries. Charcoal is used by over 10 percent of people in sub-Saharan Africa, while almost 30 percent of people in China use coal, and 11 percent in India use dung.

The majority of people in developing countries use either wood or gas as their primary fuel for cooking. More than 40 percent of people living in developing countries rely primarily on wood for cooking, which also includes wood chips, straw, and agricultural residue. Almost one-third of people use gaseous fuels (including natural gas, LPG, and biogas) as their primary cooking fuel (Figure 9). Use of gas is much less common in the LDCs and sub-Saharan Africa, where only 7 percent and 4 percent of the population, respectively, rely on gas as their main cooking fuel (Figure 10).

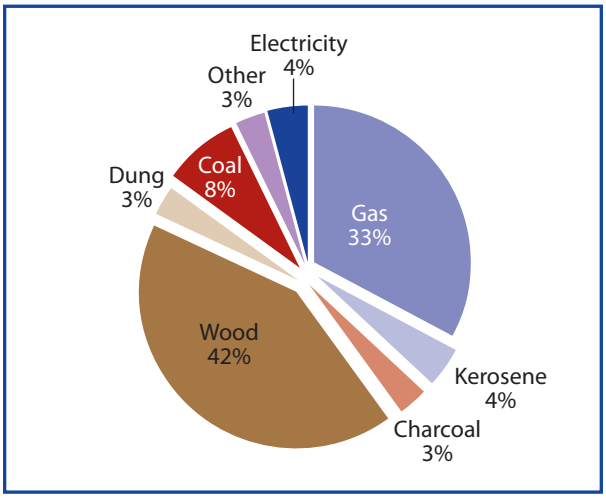
Overall, some 40 percent of people in developing countries have access to modern fuels for cooking (Figure 10). In contrast, the share of population in LDCs and sub-Saharan Africa with access to electricity, gas, or kerosene is only 9 percent and 17 percent, respectively.

Figure 8. Share of population relying on different types of solid fuels for cooking by developing regions, 2007



Notes: Based on UNDP's classification of developing countries. China's estimates are calculations based on rural and urban estimations. Coal includes coal dust and lignite. Wood includes wood, wood chips, straw, and crop residues.

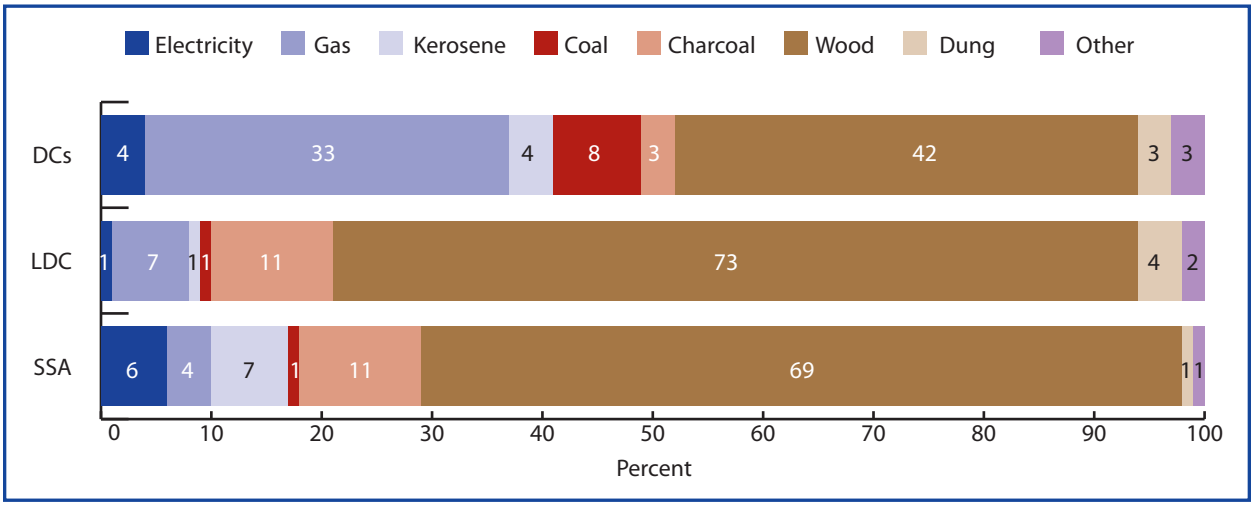
Figure 9. Share of population in developing countries relying on different types of cooking fuels, 2007



Notes: Gas includes natural gas, LPG, biogas, and ethanol. Kerosene includes kerosene and paraffin. Coal includes coal dust and lignite. Wood includes wood, wood chips, straw, and crop residues. Other includes missing data, 'no cooking in the house', and other fuels.

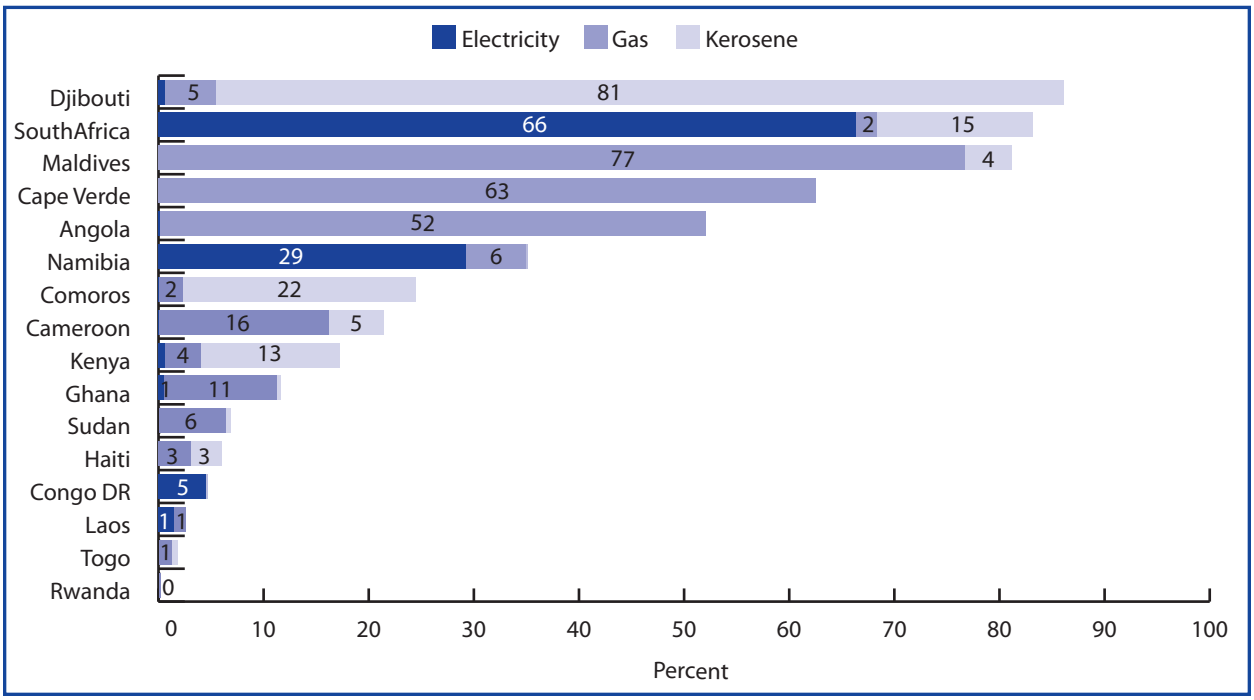
Developing countries differ widely in their reliance on fuels used for cooking and in the types of modern fuels used. Figure 11 shows the reliance on different types of modern fuels for selected LDCs and sub-Saharan countries. Of the countries considered, only South Africa and Namibia rely heavily on electricity for cooking. Use of kerosene as a cooking fuel is concentrated in a few countries, especially Djibouti, where it is used by 81 percent of the population as a primary cooking fuel. Gas is a principal fuel in several countries, including Angola, Cape Verde, and the Maldives.

Figure 10. Share of population relying on different types of cooking fuels in LDCs and SSA, 2007



Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Gas includes natural gas, LPG, biogas, and ethanol. Kerosene includes kerosene and paraffin. Coal includes coal dust and lignite. Wood includes wood, wood chips, straw, and crop residues. Other includes missing data, 'no cooking in the house', and other fuels.

Figure 11. Share of population relying on different types of modern fuels for cooking for selected LDCs and SSA countries, 2007

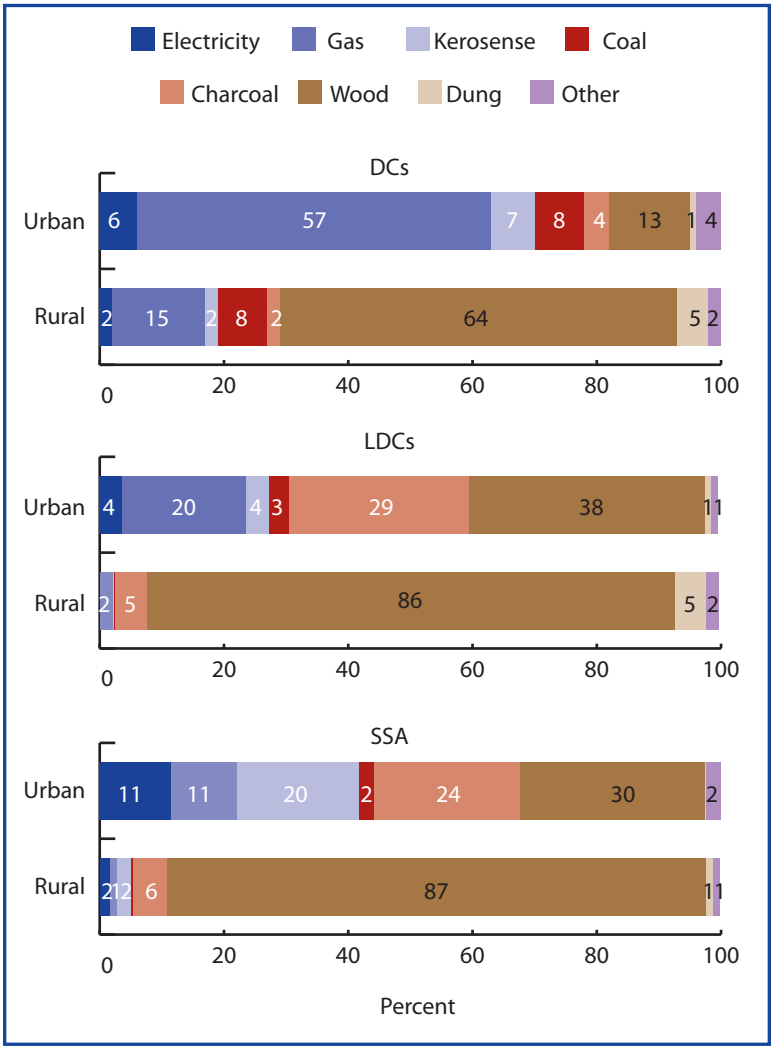


Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Gas includes natural gas, LPG, biogas, and ethanol. Kerosene includes paraffin (mainly used in Kenya and South Africa).

Rural populations rely much more heavily on solid fuels as their primary cooking fuel than urban dwellers do (Figure 12). While almost 80 percent of rural people rely on solid fuels (coal, charcoal, wood, and dung) for cooking, only 26 percent of urban dwellers rely on these fuels. Wood is the most commonly used solid fuel in rural areas (used by 64 percent of people), while gas is the most commonly used modern fuel in urban areas (used by 57 percent of people).

In LDCs and sub-Saharan Africa, more than 85 percent of people living in rural areas rely on wood and its by-products as their primary cooking fuel. In urban areas, wood is still used by 38 and 30 percent of LDCs and sub-Saharan Africa populations, respectively. Charcoal is an important fuel in LDCs and sub-Saharan Africa, especially for urban dwellers (29 percent of urban dwellers in LDCs and 24 percent of urban dwellers in sub-Saharan Africa use charcoal, compared with 4 percent of urban populations in developing countries overall). Kerosene is used by 20 percent of urban populations in sub-Saharan Africa, compared with only 7 percent of urban residents in developing countries overall.

Figure 12. Share of population relying on different types of cooking fuels in rural and urban areas of LDCs and SSA countries, 2007



Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs.There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Wood includes wood, wood chips, straw, and crop residues. Gas includes natural gas, LPG, biogas, and ethanol. Coal includes coal dust and lignite. Kerosene includes kerosene and paraffin. Other includes missing data, 'no cooking in the house', and other fuels.

B. Improved cooking stoves

Less than half of developing countries have data on access to improved cooking stoves (ICSs). Data were found for 67 of 140 countries, accounting for more than 90 percent of the population of developing countries relying on solid fuels[21] (see Table 6).

Of the total population in developing countries relying on solid fuels for cooking, only a small share use improved cooking stoves (Table 7). Almost 830 million people in developing countries use improved cooking

[21] Analyses related to ICSs were conducted taking into account only the share of population relying on solid fuels. That is, statistics exclude the share of population using electric or gas stoves for cooking.

Table 6. Number of countries with data available on improved cooking stoves

	Total no. of countries	Improved cooking stoves	
		No. of countries with data available	% of population represented by the data available[1]
Developing countries	140	67	91.4
LDCs	50	28	71.8
Sub-Saharan Africa	45	30	77.1

[1] Percent of the population of the reporting countries among total population of developing countries relying on solid fuels.

Notes: Availability as October 2009, as determined by authors' desk study. Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Improved cooking stoves refer to closed stoves with chimney, as well as open stoves or fires with chimney or hood, but exclude open stoves or fires with no chimney or hood. Stoves used for cooking with electricity, liquid fuels, or gaseous fuels are not included.

stoves for their cooking needs. Of these, only 44 million live in LDCs and 34 million in sub-Saharan Africa, the areas most heavily dependent on traditional biomass fuels for cooking.

In its report *Renewables 2007 Global Status Report* (2007), REN21 estimates the number of ICSs disseminated to be 220 million, covering about 38 percent of households worldwide. However, the report notes that some of the disseminated stoves may no longer be in use. However, in this publication, the measure of access is estimated based on the number of people who use ICSs at present.

More than two-thirds of people who use improved cooking stoves live in China (Figure 13). Other Asian and Pacific countries account for about another 20 percent of people using ICSs, while sub-Saharan Africa, where more than 80 percent of people rely on solid fuels for cooking, accounts for only 4 percent of people using ICSs.

Fewer than 30 percent of people in developing countries who rely on solid fuels for cooking (i.e., traditional biomass and coal) use improved cooking stoves (Figure 14). Access to ICSs is even more limited in LDCs and sub-Saharan Africa, where only 6 percent of people who use traditional biomass and coal for cooking have access to improved stoves. These are also the countries where access to modern fuels for cooking is the lowest.

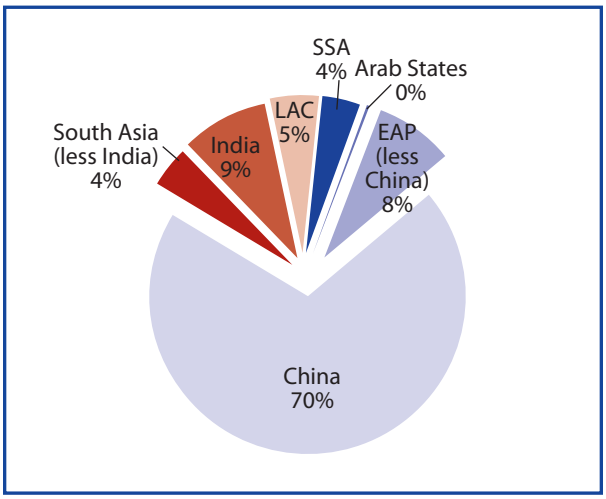
Access to ICSs varies among developing countries, but is less than 50 percent for almost all LDCs and sub-Saharan African countries where data are available. In most of the countries for which data are available, fewer than 10 percent of people who rely on solid fuels use ICSs (Figure 15). However, in some countries, such as Guinea-Bissau, Mauritania, South Africa, and Swaziland, access is much higher.

Table 7. Number of people relying on solid fuels with access to ICS, 2007

	No. of people with access to ICS (in millions)
Developing countries	828
LDCs	44
Sub-Saharan Africa	34

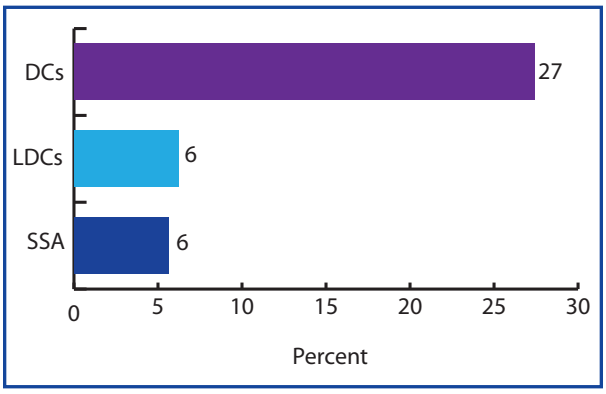
Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Improved cooking stoves refer to closed stoves with chimney, as well as open stoves or fires with chimney or hood, but exclude open stoves or fires with no chimney or hood. Stoves used for cooking with electricity, liquid fuels, or gaseous fuels are not included. For information on developing-region populations, see Appendix 6.

Figure 13. Distribution of people with access to ICS by developing regions, 2007



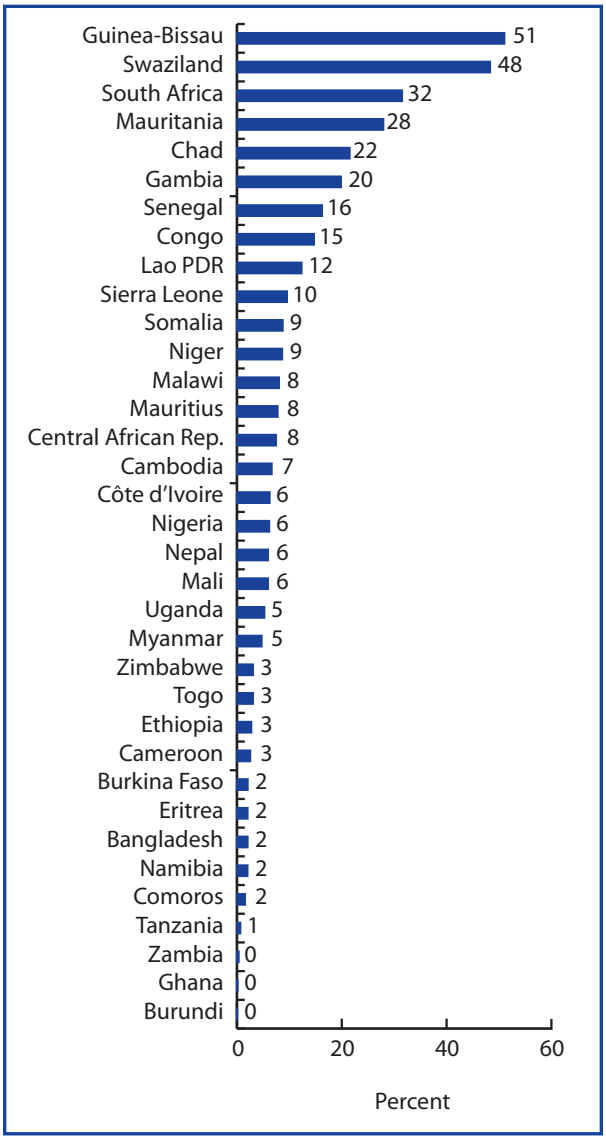
Notes: DC regions based on UNDP's classification of countries. Improved cooking stoves refer to closed stoves with chimney, as well as open stoves or fires with chimney or hood, but exclude open stoves or fires with no chimney or hood. Stoves used for with electricity, liquid fuels, or gaseous fuels are not included.

Figure 14. Share of population relying on solid fuels for cooking with access to ICS, 2007



Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Improved cooking stoves refer to closed stoves with chimney, as well as open stoves or fires with chimney or hood, but exclude open stoves or fires with no chimney or hood. Stoves used for with electricity, liquid fuels, or gaseous fuels are not included.

Figure 15. Share of population relying on solid fuels for cooking with access to ICS for selected LDCs and SSA countries, 2007



Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Improved cooking stoves refer to closed stoves with chimney, as well as open stoves or fires with chimney or hood, but exclude open stoves or fires with no chimney or hood. Stoves used for with electricity, liquid fuels, or gaseous fuels are not included.

V. HEALTH IMPACTS OF HOUSEHOLD ENERGY USE

Lack of access to clean, efficient, modern energy in the home can impact health in many ways. The most important direct health effects result from the air pollution caused by burning solid fuels, often indoors on open fires and simple stoves (Bruce et al. 2000; WHO 2006). The indoor use of open fires or inefficient stoves in households releases large amounts of smoke from incomplete combustion of solid fuels—primarily wood, but in many cases coal, animal dung, and/or crop wastes. Breathing this smoke affects the health of all members of the family, but especially that of women and their young children.

The communities that are most reliant on solid fuels typically have very limited access to efficient cooking stoves (see Chapter 4). Even when households have access to improved stoves, they may result in only small improvements to indoor air quality, and may be poorly maintained (Albalak et al. 2001).

Besides the health effects of indoor smoke released by incomplete combustion of solid fuels, other health-related impacts associated with household fuel use in poor countries include: burns and scalds from open fires or semi-open stoves; poisoning of children who drink kerosene fuel stored in soft drink bottles; risk of injury and violence (primarily to women) while collecting wood and other solid fuels; and missed time from school for older children involved in fuel collection. The time spent collecting solid fuel also imposes opportunity costs that constrain socio-economic development generally. While all these issues are important, this chapter focuses on the health impacts arising from smoke pollution, the largest and best-documented effect.

A. Health problems linked to solid fuel use

There is good evidence linking smoke from solid fuel use in developing countries with three important diseases—child pneumonia, chronic obstructive pulmonary disease (COPD), and lung cancer (Dherani et al. 2008; WHO 2004a). Smoke from incomplete combustion of solid fuels contains many substances known to be toxic to human health through a variety of mechanisms.[22] Among these pollutants, small particulate matter[23] and carbon monoxide have been most commonly measured in homes using solid fuels.[24] Box 2 indicates the additional risks of these diseases, known as the 'relative risk',[25] resulting from exposure to smoke from solid fuel use. There are indications that smoke from solid fuel use increases the risk of other serious diseases; however, the evidence for these has so far not been considered conclusive enough for inclusion in WHO's Global Burden of Disease assessment. (For a more detailed summary of the available evidence, see Annex 3.)

Worldwide, almost 2 million deaths per year are attributable to solid fuel use, with more than 99 percent of these deaths occurring in developing countries (Table 8). This is equivalent to 3.3 percent of all deaths globally. These deaths are concentrated in particular developing regions. For instance, while the LDCs make up about 12 percent of total population, they account for almost 30 percent of deaths attributed to solid fuel use. The death rate per million of population in LDCs and sub-Saharan Africa is more than twice that of other developing regions (771 and 781 per million per year, respectively, versus 378 per million per year for developing countries overall).

[22] These mechanisms include airway irritation, damage to immune and other defences against bacteria, oxidative stress, impairing oxygen supply to the placenta and fetus, and increasing the risk of cancer.

[23] Particulate matter are airborne particles of complex mixtures of chemicals and carbon, some of which are small enough to be breathed deep into the lungs and absorbed into the blood stream.

[24] See Annex 3, Table 14.

[25] A relative risk is indicates how much more likely it is that a person will get the disease if exposed to solid fuel smoke, compared with someone who is not.

Box 2. Diseases with good evidence of a link with solid fuel use

- Child pneumonia (up to age 5 yr): risk for exposed children increased 2.3 times.
- Chronic obstructive pulmonary disease (COPD) (30 yr and above): risk for exposed people increased 3.2 times for women, 1.8 times for men.
- Lung cancer (30 yr and above): where coal is used (mainly China), risk for exposed people increased 1.9 times for women, 1.5 times for men.

Source: WHO 2004a.

A broader measure of the burden of disease ('disability-adjusted life years', known as DALYs[26]) attributable to solid fuel use indicates an even more concentrated impact on particular developing regions. The DALY measure includes the years of life lost as a result of premature death caused by a disease as well as the years lived with a disease. As shown in Table 8, of the approximately 40 million DALYs worldwide attributable to solid fuel use, some 18.4 million (45 percent) occur in LDCs and some 18.0 million (44 percent) occur in sub-Saharan Africa. Because the DALY measure captures the many years of life lost due to deaths from child pneumonia, it shows an even stronger impact of solid fuel use on health in the poorest countries, where pneumonia is a major cause of death in children under 5 years of age.

Table 8. Numbers and rates of deaths and DALYs per million population attributable to indoor air pollution from solid fuel use, for all causes (pneumonia, COPD, lung cancer), 2004[27]

	Attributable deaths per year		Attributable DALYs per year	
	Number ('000)	Per 1 million population	Number (in millions)	Per 1 million population
Developing countries	1,944	378	40.5	7,878
LDCs	577	771	18.4	24,606
Sub-Saharan Africa	551	781	18	25,590
South Asia	662	423	14.2	9,075
Arab States	35	114	1.1	3,489
East Asia and Pacific	665	341	6.5	3,308
Latin America and Caribbean	29	54	0.7	1,334
World	1,961	305	41	6,374

Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries).

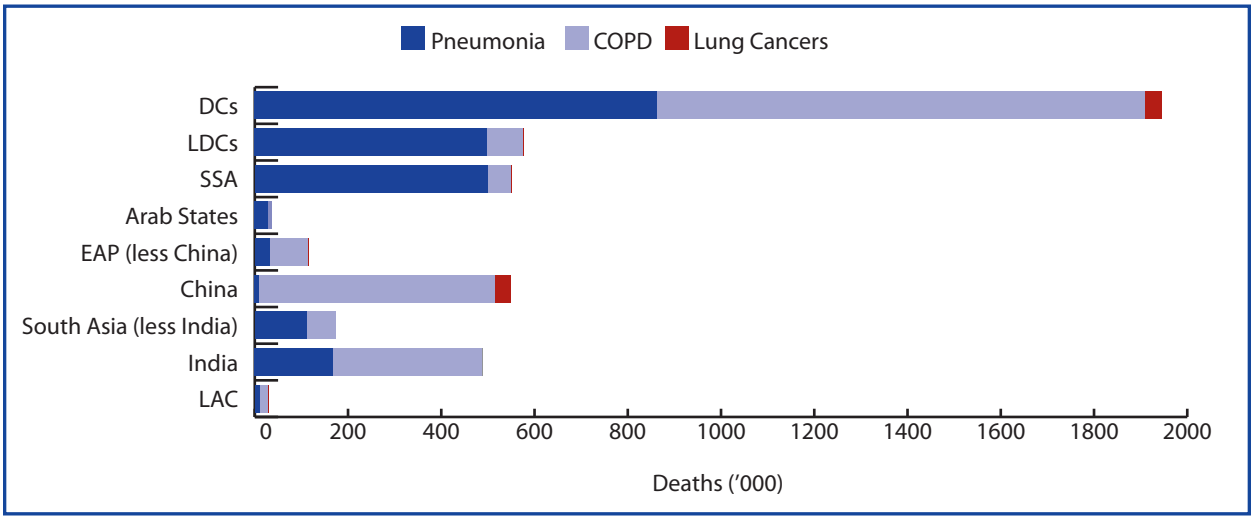
Developing regions differ with respect to the pattern of premature deaths from the three disease conditions attributable to smoke from solid fuel use. In developing countries overall, COPD accounts for slightly more than half of all deaths attributable to solid fuel use, while pneumonia accounts for slightly less than half (Figure 16). In the poorest countries, the LDCs and sub-Saharan Africa, however, child pneumonia makes up a far larger share, because the disease is most common in these countries. On the other hand,

[26] For a detailed description of the DALY, see chapter 2 on methodology.

[27] The year 2004 is the latest for which WHO has country health statistics, and therefore all deaths and DALYs are for 2004 (WHO 2009b).

COPD predominates in China and India, mainly because the underlying rate of COPD is relatively higher in those countries. Deaths from lung cancer, linked to coal exposure, represent a relatively small share of total deaths attributable to solid fuel use, since the use of coal for cooking is limited to a few countries.

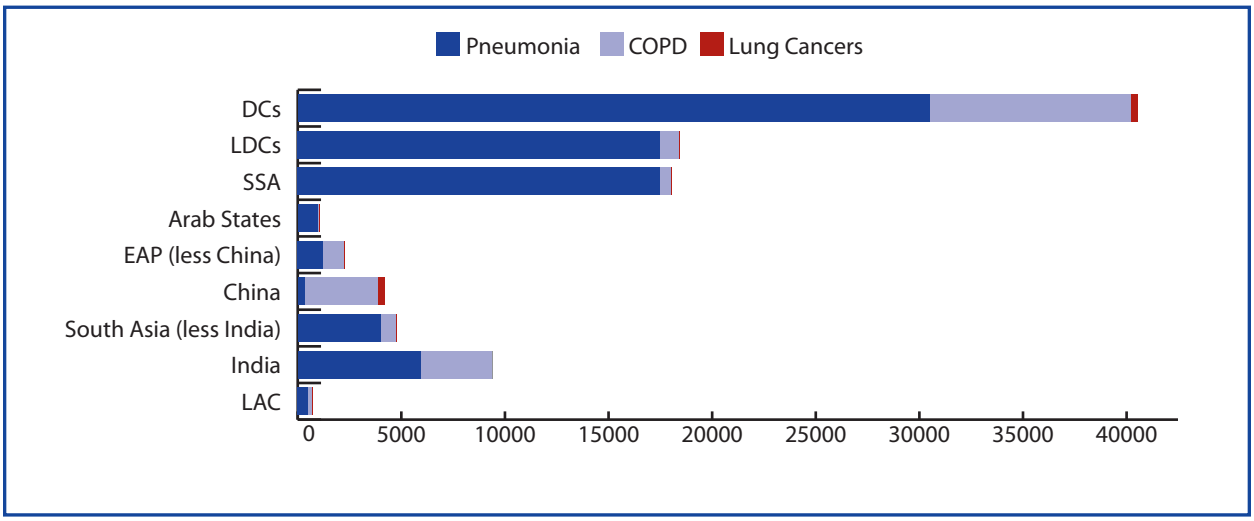
Figure 16. Number of deaths attributable to indoor air pollution from solid fuel use, by diseases, 2004



Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries).

Differences between regions in disease-specific burden attributable to solid fuel use are more pronounced when expressed as DALYs. As shown in Figure 17, child pneumonia accounts for some 75 percent of DALYs attributable to solid fuel use in developing countries overall (compared with less than half of all premature deaths, as shown in Figure 16), and an even greater share of DALYs in LDCs and sub-Saharan Africa. In India, pneumonia accounts for more than half of all DALYs attributable to solid fuel use (but only about a third of premature deaths). As indicated earlier, this difference is due mainly to the fact that the DALY measure captures the many years of life lost due to premature death from pneumonia early in life.

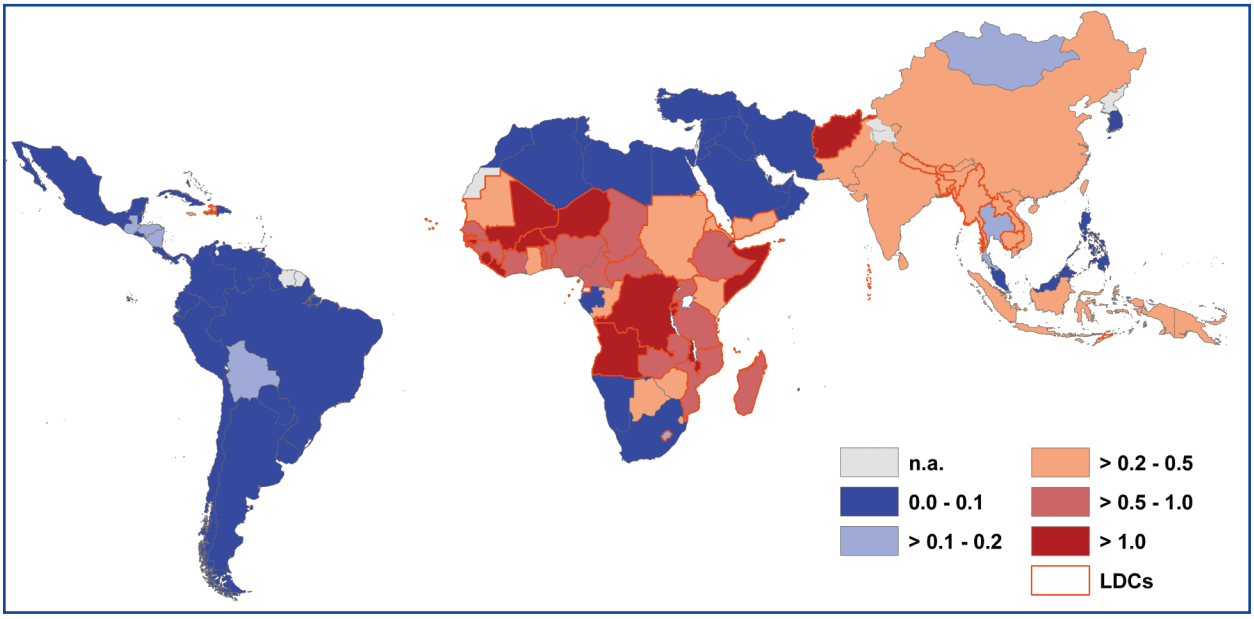
Figure 17. Number of DALYs attributable to indoor air pollution from solid fuel use, by diseases, 2004



Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries).

Developing countries with high rates of premature deaths attributable to solid fuel use are clustered in particular global regions. As shown in Map 3, the countries with the highest rates of premature death are located mainly in sub-Saharan Africa, especially Central Africa and West Africa, while countries with medium death rates tend to be located in South Asia, East Asia, and Eastern Africa. Countries with the lowest death rates are found mainly in Latin America and the Caribbean, the Middle East and North Africa, and Southern Africa. It should be recognised however, that low or medium national rates (as in some Latin American countries) may mask large internal variations across geographical and socio-economic groups (for example, higher death rates for poor or indigenous populations compared with better-off groups in those countries).

Map 3. Number of deaths per 1000 capita per year, attributable to indoor air pollution from solid fuel use, 2004



Notes: N.A. not available. Based on UNDP's classification of developing countries and the UN's classification of LDCs. Some of the small countries and island states are not visible on the map. For a complete list of countries, see Appendix 2.© World Health Organization 2009. All right reserved. The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Worldwide, an estimated one-third of deaths from child pneumonia, COPD, and lung cancer are attributable to solid fuel use, compared with just over half of deaths from these diseases in LDCs and sub-Saharan Africa. Table 9 shows the percentage of deaths from each of the three diseases, globally and in key developing regions, that can be attributed to indoor smoke from solid fuels. For example, just over half of all pneumonia deaths (55 percent) in children under 5 years of age in LDCs are attributable to solid fuel use.

The burden of disease attributable to solid fuel use, as measured by DALYs, is particularly concentrated in sub-Saharan Africa (Map 4). The importance of lost years of life in calculating DALYs[28] is reflected in the rate of DALYs per million for child pneumonia, which is three times higher in LDCs than in developing countries overall. This is illustrated by the much higher rates in the countries of sub-Saharan Africa (Map 4). As noted above, this is because child pneumonia is particularly common in these countries (see Figures 27 a) and b) in Annex 3).

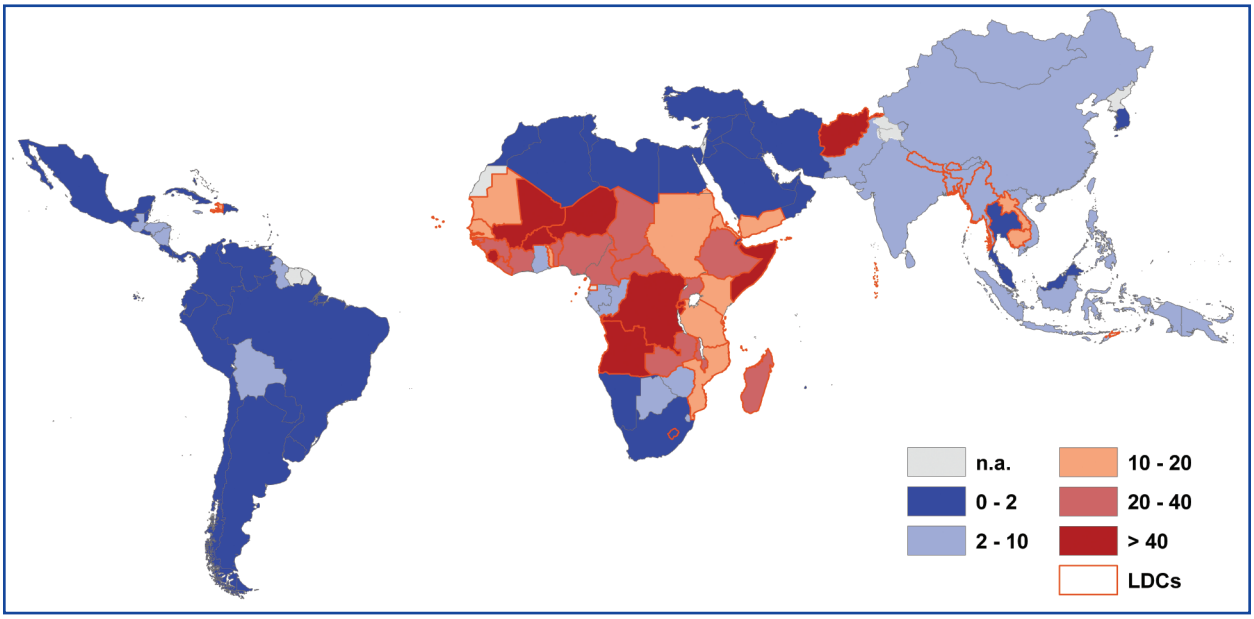
[28] See Chapter 2 on methodology.

Table 9. Share of deaths attributable to solid fuel use, by disease[29]

	Deaths attributable to solid fuel use (%)			
	Pneumonia	COPD	Lung cancer	Total
Developing countries	49	39	5	38
LDCs	55	52	0.2	52
Sub-Saharan Africa	53	45	1	51
World	49	35	2.7	32

Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries).

Map 4. Number of DALYs per 1000 capita per year, attributable to indoor air pollution from solid fuel use, 2004



Notes: N.A. not available. Based on UNDP's classification of developing countries and the UN's classification of LDCs. Some of the small countries and island states are not visible on the map. For a complete list of countries, see Appendix 2. © World Health Organization 2009. All right reserved. The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Country estimates of deaths and numbers of DALYs per 1000 capita attributable to solid fuel use are given in Annex 3, Tables 16 and 17.

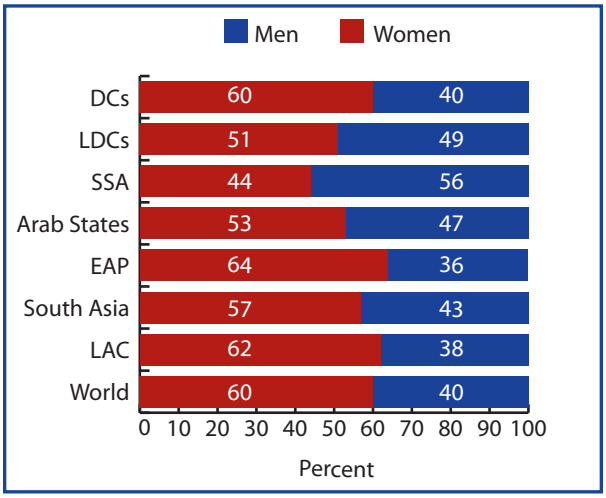
B. Another burden on the poor and women

Poverty is closely associated with the disease burden attributable to solid fuel use, and the countries with the highest rates of disease burden are in sub-Saharan Africa. Since reliance on solid fuels and inefficient stoves is closely related to poverty and indicators such as the Human Development Index

[29] The percentages presented here are applied to the group at risk, i.e., pneumonia for children up to 5 years old, for COPD and lung cancer for adults ≥ 30 years.

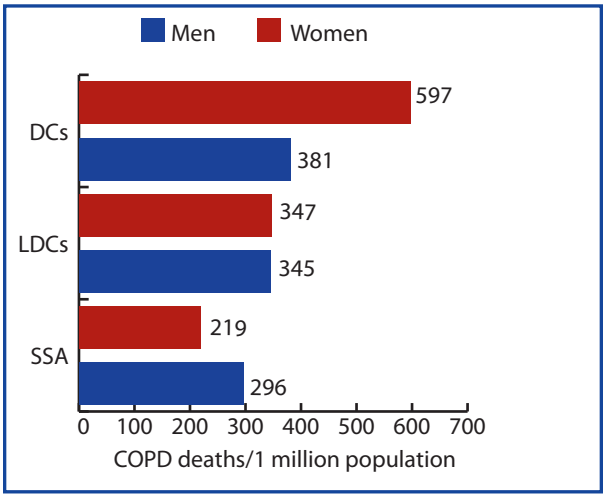
(HDI), we would expect the burden of disease associated with household energy use to show a similar association. This is the case, although modified by the relationships between poverty and the underlying rates for the three diseases concerned, and in the case of lung cancer also the concentration of household coal use in a few countries, mainly China. Overall, for all three diseases together, poverty—expressed by the HDI—is closely associated with the disease burden attributable to solid fuel use (Figures 30, 31 and 32 in Annex 3). This association is particularly strong for child pneumonia. For a more detailed discussion on the links between poverty and health impacts, see Annex 3.

Figure 18. Share by gender of COPD and lung cancer deaths attributable to solid fuel use in adults >30 years



Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries).

Figure 19. Number of COPD deaths per 1 million population attributable to solid fuel use, by gender

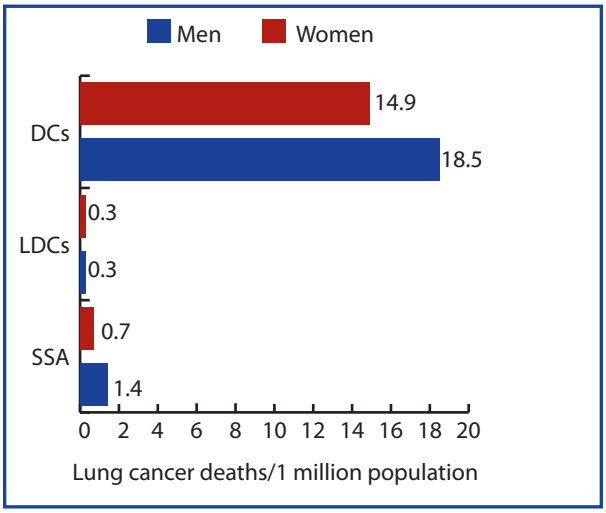


Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries).

In developing countries, 60 percent of all deaths from COPD and lung cancers attributable to solid fuels are amongst women (Figure 18). Since women are generally in charge of cooking and spend a large amount of time in the kitchen, they bear a larger burden of disease as a result of their higher exposure to indoor air pollution. The ratio of death rates in women compared to men are highest in East Asia and the Pacific, where women account for 64 percent of all deaths from COPD and lung cancer attributable to solid fuel use. For child pneumonia, no analysis by gender was performed as the available studies do not allow separate estimation of the risk of child pneumonia for boys and girls.

For each cause of death, rates of mortality attributable to solid fuel use differ by gender and developing region. For developing countries overall, women experience substantially more of the COPD deaths attributable to solid fuels than men (Figure 19). This is not the case in the poorest countries, however. As shown in Figure 19, the attributable death rates for COPD are similar for men and women in the LDCs and actually lower for women in sub-Saharan Africa. These patterns are due to the lower underlying death rates for COPD in women compared with men in LDCs, as compared with the situation

Figure 20. Number of lung cancer deaths per 1 million population attributable to solid fuel use, by gender



Notes: Based on UNDP's classification of developing countries and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries).

in East Asia and the Pacific. This does not mean that we should be less concerned about the impact on women's health in the poorest countries, as women have considerably greater exposure to solid fuel smoke than men, and will experience more COPD as this disease becomes increasingly common in these countries.

For lung cancers, resulting from exposure to coal combustion, the picture is rather different (Figure 20). Indeed, men are more affected across the developing countries. This is explained by the higher prevalence of smoking in men, resulting in higher underlying death rates from lung cancer in the male population.

C. Effects on global warming: an opportunity to secure health and climate 'co-benefits'

Many of the same pollutants that damage health—notably black carbon, (non-methane) volatile organic compounds, and carbon monoxide, plus methane—also have global warming effects. Even when biomass fuels are renewably harvested, thereby avoiding a net increase of atmospheric CO2, these other greenhouse pollutants still contribute to significant climate warming as a result of the very incomplete combustion of carbon-based fuels achieved in traditional stoves.

Compared to the power generation, transport, and other energy-intensive activities of developed countries, the climate warming effect of household energy use in poor countries is not great; however, it is significant. Consequently, interventions that improve solid fuel combustion efficiency and hence reduce both emissions and exposure to pollutants can benefit health and mitigate climate change, opening up possibilities for using carbon finance to help reduce the costs to the poor of accessing clean and efficient household energy. Indeed, initial efforts to take advantage of the climate benefits of household energy interventions, have shown that the resulting carbon finance can make an important contribution to program funding.

VI. DEVELOPING COUNTRIES WITH ENERGY ACCESS TARGETS

Almost half of developing countries (68 of 140) have established targets for access to electricity. Of these, 35 are in sub-Saharan Africa (Table 10). This represents a significant increase in the number of countries with electricity access targets as reported by an earlier UNDP study, based on 2005 data, which found that only 21 percent of national MDG reports contained energy targets disaggregated by fuel and/or source (UNDP 2007a).

Table 10. Number of developing countries with energy access targets

	Developing Countries	LDCs	Sub-Saharan Africa
Electricity	68	25	35
Modern fuels	17	8	13
Improved cooking stoves	11	4	7
Mechanical power	5	0	5
Total no. of countries	**140**	**50**	**45**

Notes: Includes countries with a target at the national level or for rural or urban areas, as of October 2009, as determined by the authors' desk study. Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, with 31 countries belonging to both categories (see Appendix 2 for a list of countries). Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas, and kerosene, and exclude traditional biomass (e.g., firewood, charcoal, dung) and coal (including coal dust and lignite). Improved cooking stoves refer to closed stoves with chimney, as well as open stoves or fires with chimney or hood, but exclude open stoves or fires with no chimney or hood. Stoves used for cooking with electricity, liquid fuels, or gaseous fuels are not included. Mechanical power refers to the transmission of energy through a solid structure to impart motion, such as for pumping, pushing, and other similar needs (e.g., for milling, grinding, water pumping) and is obtained from energy carriers (e.g., electricity, traditional fuels) or energy sources transmitted directly (e.g., wind, hydraulic, geothermal).

Regions vary considerably with respect to the proportion of countries having targets for electricity access (Figure 21). For instance, more than three-quarters of sub-Saharan countries (35 of 45) have set targets for electricity access, compared with only half of developing countries generally. A large proportion of South Asian countries (67 percent) have also established targets for electricity access.

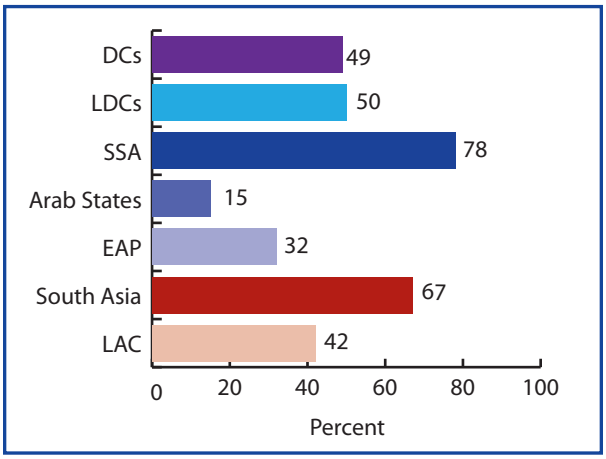
In contrast, very few countries have set targets for access to modern fuels (17 countries), access to improved cooking stoves (11 countries), or access to mechanical power (5 countries).[30] Some 29 percent of sub-Saharan countries have established targets for access to modern fuels, compared with only 12 percent of developing countries generally and only 16 percent of LDCs (Figure 22).

Sub-Saharan countries also lead in setting targets for access to improved cooking stoves (ICSs), with 16 percent having established targets, compared with only 8 percent of developing countries generally (Figure 23).

The five countries that have established targets on access to mechanical power—Benin, Cameroon, Central African Republic, Mali, and Togo—are all located in sub-Saharan Africa.

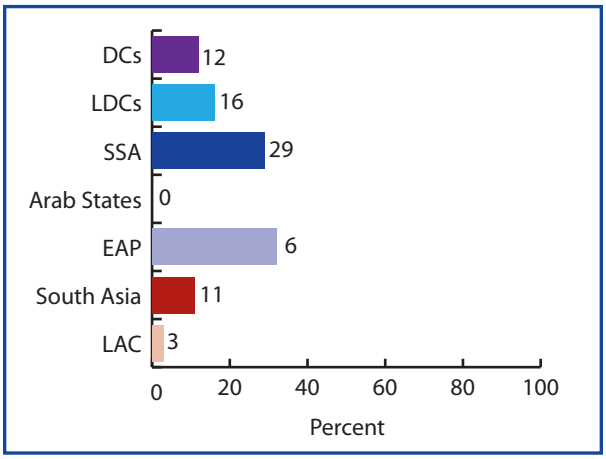
[30] The number of countries with energy access targets presented in this study refers to countries with national, rural, or urban targets.

Figure 21. Share of countries with electricity access targets by region



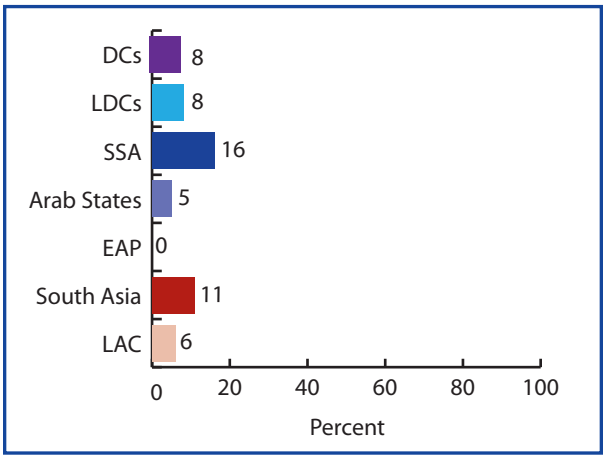
Notes: Includes countries with a target at the national level or for rural or urban areas, as of October 2009, as determined by authors' desk study. Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries).

Figure 22. Share of countries with targets on access to modern fuels by region



Notes: Includes countries with a target at the national level or for rural or urban areas, as of October 2009, as determined by authors' desk study. Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas, and kerosene, and exclude traditional biomass (e.g., firewood, charcoal, dung) and coal (including coal dust and lignite).

Figure 23. Share of countries with targets on access to ICS by region



Notes: Includes countries with a target at the national level or for rural or urban areas, as of October 2009, as determined by authors' desk study. Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Improved cooking stoves refer to closed stoves with chimney, as well as open stoves or fires with chimney or hood, but exclude open stoves or fires with no chimney or hood. Stoves used for cooking with electricity, liquid fuels, or gaseous fuels are not included.

VII. ENERGY ACCESS IN 2015 UNDER DIFFERENT SCENARIOS

Scenarios were developed to estimate energy access in 2015 under different assumptions about progress in achieving national targets or in reaching the millennium development goals (see Box 3).[31]

Box 3. Description of scenarios

- The ***Base Case Scenario*** assumes that the proportion of the population with energy access remains the same as currently (2008 for electricity and 2007 for modern fuels). Given population growth, this will entail large increases in the absolute number of people with energy access, even with no growth in the proportion of the population with energy access.
- A second scenario, the ***National Energy Access Targets-Compatible Scenario***, assumes national targets, for those countries that have set them, are achieved in such a way that there is a constant rate of progress to 2015.[32]
- A third scenario, the ***MDG-Compatible Scenario***, assumes that global MDG-related targets for energy access are achieved in 2015. It is based on a 50 percent decrease in the proportion of people without access to modern fuels, as well as a 50 percent decrease in the proportion of people without access to electricity.[33]

A. Access to electricity

To keep pace with population growth and maintain the 2008 level of electricity access in developing countries (Base Case Scenario) will entail providing access for an additional 350 million people by 2015 (Table 11). Given the present low level of electricity access in the Least Developed Countries (LDCs) and sub-Saharan Africa, only about one-tenth of the new connections needed to maintain current levels of electricity access are in these countries.

Table 11. Additional number of people with electricity access in 2015 under different scenarios

	Additional no. of people (in millions) in 2015 over 2008		
	Base Case Scenario	National Targets-Compatible Scenario	MDG-Compatible Scenario
Developing countries	353	1,187	1,194
LDCs	34	262	408
Sub-Saharan Africa	35	223	368

Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs (see Appendix 2 for a list of countries). There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). The Base-Case Scenario assumes the 2007 proportion of the population with access remains constant; the National Targets-Compatible Scenario assumes that national targets, where they are in place, are met; and the MDG-Compatible Scenario assumes that a 50 percent reduction occurs for those without access.

[31] Assumptions made to estimate access in 2015 are described in the methodology section (II).

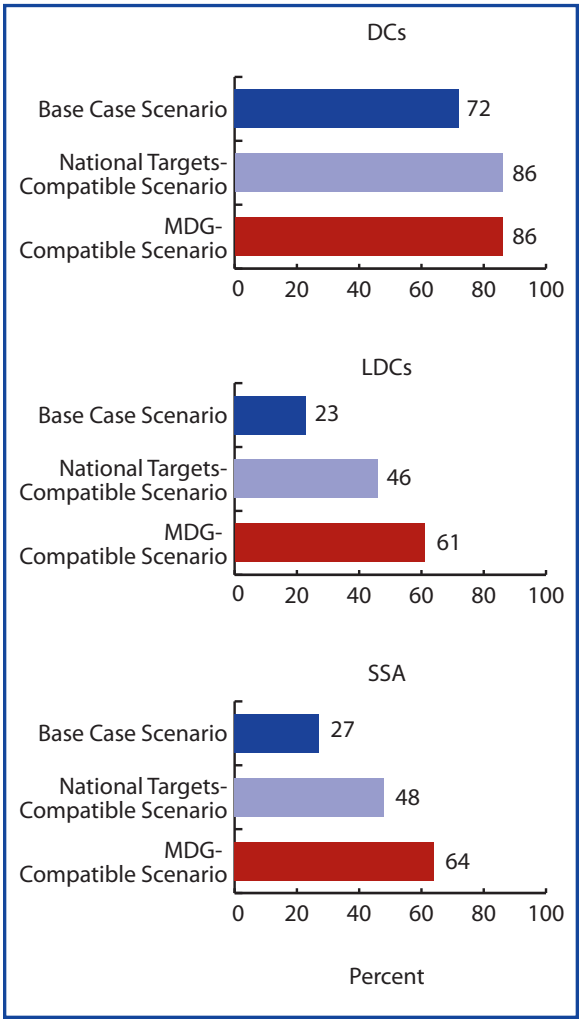
[32] The scenario assumes that national targets are achieved such that there is a constant rate of progress to 2015. For countries with no national targets in place, energy access rates in 2015 are assumed to be the same as current access rates. Because relatively few countries have set national targets for access to modern fuels, Scenario 2 was produced for access to electricity only.

[33] Since the Millennium Project (2005) has not proposed a goal for access to electricity in 2015, Scenario 3 (i.e., the MDG-Compatible Scenario) assumes a simple 50 percent reduction in the number of people without electricity access. This will bring the number of those without access to under 1 billion, as proposed in IEA's World *Energy Outlook 2006*. For further information about global and regional MDG-related energy targets, see Appendix 4.

Meeting national targets for improving electricity access (National Targets-Compatible Scenario) will require providing access to about 1.2 billion additional people in developing countries by 2015. Electricity access in developing countries overall will rise from the 2008 level of 72 percent to 86 percent in 2015 if national targets are met (Figure 24). Although only half of developing countries have set national targets for electricity access, some large countries have set ambitious targets, which, if achieved, would result in large gains in the number of people with access. For instance, India has set a target of providing electricity access for 100 percent of its people by 2012, a substantial rise from the 2008 level of 65 percent.

Achieving global MDG-related targets for energy access (MDG-Compatible Scenario) will require similar increases in the number of people with electricity access (i.e., almost 1.2 billion) and an analogous rise in the proportion of people with access (i.e., from 72 percent at present to 86 percent in 2015). In absolute terms, about one-third of the number of new connections in developing countries would be in LDCs or sub-Saharan Africa. However, because of the present low levels of access in these countries, the proportion of people with electricity access would rise dramatically—from 23 percent at present to 61 percent in 2015 in LDCs, and from 27 percent at present to 64 percent in 2015 in sub-Saharan Africa.

Figure 24. Share of population with electricity access in 2015 under different scenarios



Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). The Base-Case Scenario assumes the 2008 proportion of the population with access remains constant, the National Targets-Compatible Scenario that national targets, where they are in place, are met, and the MDG-Compatible Scenario assumes a 50 percent reduction in the proportion of those without access.

B. Access to modern fuels

Keeping pace with population growth and maintaining present levels of developing-world access to modern fuels (Base Case Scenario) will require providing access to cleaner, more efficient fuels for some 200 million additional people by 2015 (Table 12). Because of the present low level of access to modern fuels in LDCs and sub-Saharan Africa, fewer than 20 million of these people would be in these countries.

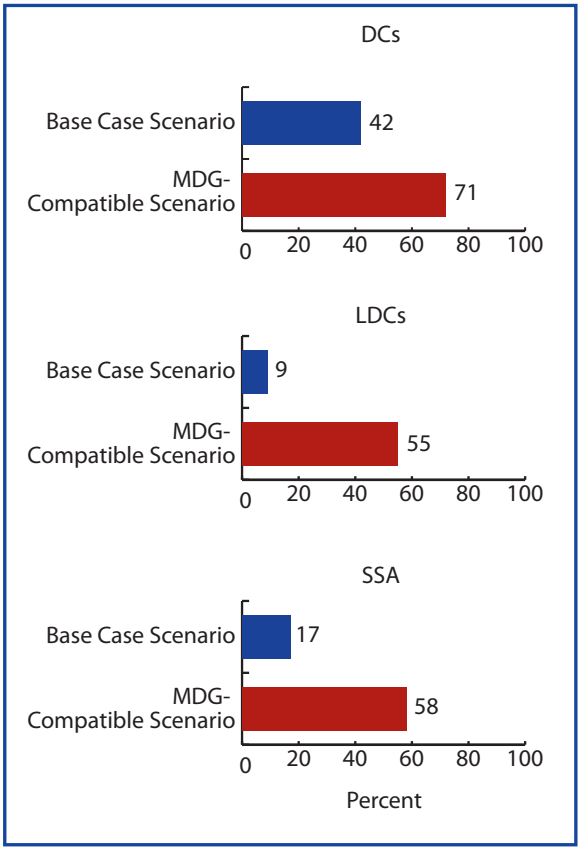
Meeting global MDG-related goals (third scenario) for energy access will entail providing access to modern fuels to about 2 billion additional people in developing countries. In absolute terms, about one-fifth of these people would be in LDCs or sub-Saharan Africa. However, this would boost the proportion of people in these regions with access to clean, efficient fuels from 9 percent to 55 percent in LDCs and from 17 percent to 58 percent in sub-Saharan Africa (Figure 25).

Table 12. Additional number of people with access to modern fuels in 2015 under different scenarios

	Additional no. of people in 2015 (in millions) over 2007	
	Base Case Scenario	MDG-Compatible Scenario
Developing countries	214	1,931
LDCs	15	454
Sub-Saharan Africa	19	400

Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas, and kerosene. The Base Case Scenario assumes that the 2007 proportion of the population with access remains constant, and the MDG-Compatible Scenario assumes a 50 percent reduction in the proportion of those without access. The National Targets-Compatible Scenario is not provided due to an insufficient number of countries with targets.

Figure 25. Share of population with access to modern fuels in 2015 under different scenarios



Notes: Based on UNDP's classification of developing countries, and the UN's classification of LDCs. There are 50 LDCs and 45 SSA countries, of which 31 countries belong to both categories (see Appendix 2 for a list of countries). Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas, and kerosene. The Base Case Scenario assumes that the 2007 proportion of the population with access remains constant, and the MDG-Compatible Scenario assumes a 50 percent reduction in the proportion of those without access. The National Targets-Compatible Scenario is not provided due to an insufficient number of countries with targets.

VIII. CONCLUSIONS

This report aims to draw attention to key areas relevant to tracking progress on energy access.

First, this report sought out data on energy access, which includes not only access to energy carriers, but also the services provided by energy end uses. Data on access to electricity are almost universally available. Data on type of fuels used for cooking and improved cooking stoves are available for a good number of countries. While access to mechanical power is critical for poverty reduction, information is available for only three countries.

Second, a large number of countries do not have energy access targets in place, particularly for those aspects of energy access that are most crucial for reducing poverty. A growing number of countries, especially in sub-Saharan Africa, have set energy access targets, mostly for electricity. However, few countries have targets for improving access to energy for meeting basic needs, including modern fuels for cooking, improved cooking stoves, and mechanical power.

Third, the efficiency, utility, and cleanliness of household energy systems in developing countries impacts on health in many ways. Indoor air pollution arising from poor combustion of biomass and coal is responsible for nearly 2 million deaths globally each year, almost all in developing countries. Nearly half (44 percent) of these deaths are from child pneumonia, and the remainder from chronic lung disease and lung cancer, of which women bear a larger share (60 percent). Of all deaths from these three causes, 38 percent in developing countries and 52 percent in LDCs, can be attributed to solid fuel use, providing a clear indication of the potential that household energy interventions have for health improvement. The poorest countries also have the highest burden of disease from solid fuels, particularly in the case of child pneumonia, which remains the single most important cause of deaths in children under five years. This combination of poor access to clean and efficient energy and high rates of disease among households living in great poverty emphasises the importance of coordinated policy and action on household energy, health, and development.

Fourth, developing countries overall are behind in making progress toward improving access to modern energy services. Given current trends, levels of modern energy access compatible with reaching the Millennium Development Goals will in many instances not be met, nor will many nationally established targets be attained. This lack of progress in providing access to modern energy services will act as a bottleneck, severely constraining many countries' ability to meet their overall development aspirations.

Greater broad-based efforts are needed to expand access to modern energy services to those who lack access, especially to heat for cooking, and mechanical power in rural and remote areas. Setting targets is a necessary step in providing a framework for tracking progress and accountability, but is only one piece of the broader effort needed to expand energy access. Political leadership, appropriate priorities and policies, and the massive scaling up of programmes are also needed to enhance opportunities for investment.

REFERENCES

Albalak, R., Bruce, N. G., McCracken, J. P., & Smith, K. R. 2001. 'Indoor respirable particulate matter concentrations from an open fire, improved cookstove, and LPG/open fire combination in a rural Guatemalan community', Environmental Science and Technology, vol. 35, pp. 2650-2655

Bangladesh Bureau of Statistics. 2007. *Key finding of HIES – 2005*.

Bruce, N. G., Perez-Padilla, R., & Albalak, R. 2000. 'Indoor air pollution in developing countries: a major environmental and public health challenge.' Bulletin of the World Health Organisation, vol. 78, pp. 1078-1092.

Bruce, N. G., Rehfuess, E., Mehta, S., Hutton, G., & Smith, K. R. 2006. 'Indoor Air Pollution' in Disease Control Priorities in Developing Countries - Second Edition, D. T. Jamison et al., eds., Oxford University Press/The World Bank, New York, pp. 793-815.

CEMAC. 2006. Cadre d'analyse logique du Plan d'Action CEMAC.

Dherani, M., Pope, D., Mascarenhas, M., Smith, K. R., Weber, M., & Bruce, N. G. 2008. 'Indoor air pollution from unprocessed solid fuel use and pneumonia risk in under-5 children: systematic review and meta-analysis', Bulletin of the World Health Organisation, vol. 86, no. 5, pp. 390-398.

EAC. 2007. Strategy on Scaling Up Access to Modern Energy Services in Order to Achieve the Millennium Development Goals.

ECOWAS (UEMOA). 2006. White Paper for a regional policy, geared towards increasing access to energy services for rural and peri-urban populations in order to achieve the Millennium Developments Goals.

FAO. 2001. Wood energy information in Africa.

FEMA. 2005. FEMA Position Paper: Energy and theMDGs.

GNESD. 2007. Reaching the Millennium Development Goals and Beyond. Global Network on Energy for Sustainable Development.

IEA/OECD. 2004. World Energy Outlook 2004.

IEA/OECD. 2006. World Energy Outlook 2006.

IEA/OECD. 2009. World Energy Outlook 2009.

IMF. 2005. Bangladesh: Unlocking the Potential National Strategy for Accelerated Poverty Reduction.

IMF. 2006. Implementation of the Growth and Poverty Reduction Strategy Cape Verde. PRSP Progress Report.

IMF. 2007. Senegal: *Poverty Reduction Strategy Paper*, IMF Country Report No. 07/316.

Millennium Project, UNDP, World Bank, and ESMAP. 2005. *Energy Services for the Millennium Development Goals*.

REN21. 2007. *Renewables 2007 Global Status Report*. Renewable Energy Policy Network for the 21st Century.

SADC, undated. Regional Indicative Strategic Development Plan.

Uganda, Republic of. 2007. *The Renewable Energy Policy for Uganda*. Ministry of Energy and Mineral Development.

UN. 2007. *Least Developed Countries*: List (accessed December 2007).

UNDP. 2005a. MDG Monitoring and Reporting: A Review of Good Practices.

UNDP. 2005b. Millennium Development Goals Bangladesh Progress Report.

UNDP. 2006. OMD Présentation du Rapport Diagnostic Secteur Energie.

UNDP. 2007a. A Review of Energy in National MDG Reports.

UNDP. 2007b. Energizing Poverty Reduction A Review of the Energy-Poverty Nexus in Poverty Reduction Strategy Papers.

UNDP. 2007c. Human Development Report 2007.

UNPD. 2006. World Population Prospect: The 2006 Revision Population Database.

WHO 2000. Air quality guidelines for Europe, 2nd ed. Copenhagen, WHO Regional Office for Europe, 2000.

WHO 2002. WHO (2002b). World Health Report, 'Reducing risks, promoting healthy life'.

WHO. 2004a. Smith K, Mehta S, Maeusezahl-Feuz M (2004). Indoor air pollution from household use of solid fuel. In: Ezzati M, Lopez AD, Rodgers A, Murray CJL, eds. Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors. Geneva, World Health Organization, Vol. 2.

WHO. 2004b. Desai M, Mehta S, Smith K (2004) Indoor smoke from solid fuels - Assessing the environmental burden of disease at national and local levels. World Health Organization, Geneva. Environmental Burden of Disease Series No. 4.

WHO. 2005. WHO Air quality guidelines global update 2005, World Health Organisation, Copenhagen, EUR/05/5046029.

WHO. 2006. Fuel for Life.

WHO. 2009a. Global burden of disease project, accessible at www.who.int/evidence/gbd.

WHO. 2009b. Country profiles of environmental burden of disease, World Health Organization. Access: www.who.int/quantifying_ehimpacts/countryprofiles.

WHO. 2009c. Global health risks - Mortality and burden of disease attributable to selected major risks, Access: www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf

APPENDIX 1: ENERGY ACCESS AND DEVELOPMENT MEASURES

Energy's importance to development is not a matter of mere supposition. There is considerable empirical evidence to suggest a significant relationship between access to modern energy and human development. This is illustrated below via four distinct measures of development, all of which show a correlation between energy access and human development.

Figure 26 displays the relationship between a country's energy access and human development measures. The graphs illustrate the link between energy access and measures of poverty reduction. Energy access is positively correlated with human development, as evidenced by the upward sloping trend in the graphs on the Human Development Index (HDI)[34] and educational enrolment ratios. Access to energy is negatively correlated with measures of poverty and deprivation, as evidenced by the downward sloping trend in the graphs on people living on less than $1 a day, as well as child and maternal mortality rates.[35]

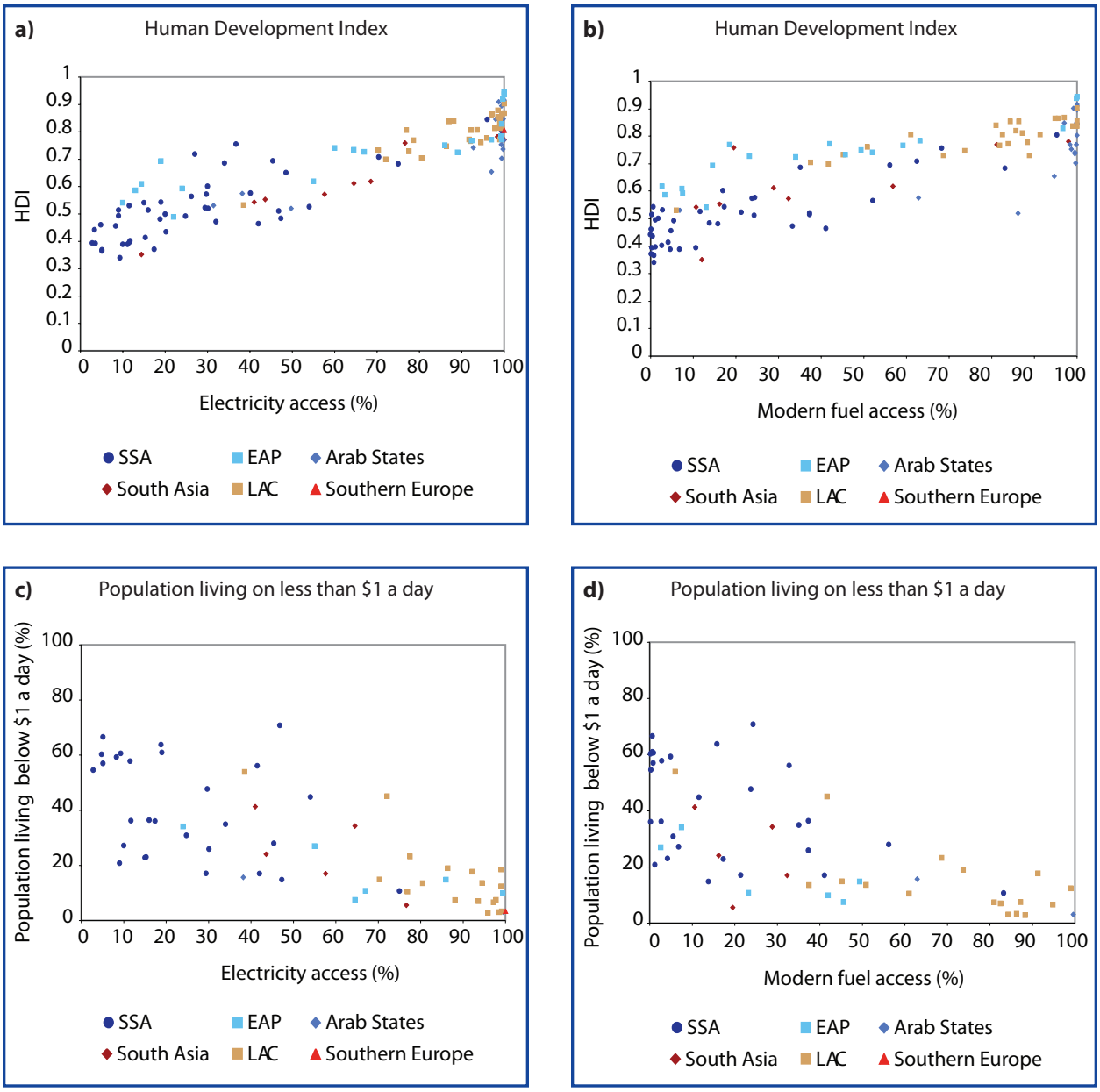
The graphs also illustrate that countries that develop do so in tandem with improvements in energy access. In fact, no country in modern times has substantially reduced poverty without a massive increase in its use of modern energy services.

While access to modern energy services alone is not sufficient to eradicate extreme poverty, it is a necessary condition for improving economic and social opportunities for poor men and women. Access to modern energy services improves productivity and enables local income generation by freeing up people's money and time for more productive uses that can improve human welfare.

[34] The HDI is a composite index produced by UNDP that measures a country's achievements in three key aspects of human development: longevity, knowledge, and a decent standard of living.

[35] These development measures are also embodied in the Millennium Development Goals. Improving access to modern energy services has positive effects on people's ability to generate income and reduce hunger (MDG 1), improve educational opportunities and health outcomes (MDGs 2, 4, and 5), and reduce gender equities (MDGs 2 and 3), all of which affect human development. Information on the MDGs is available at http://www.un.org.

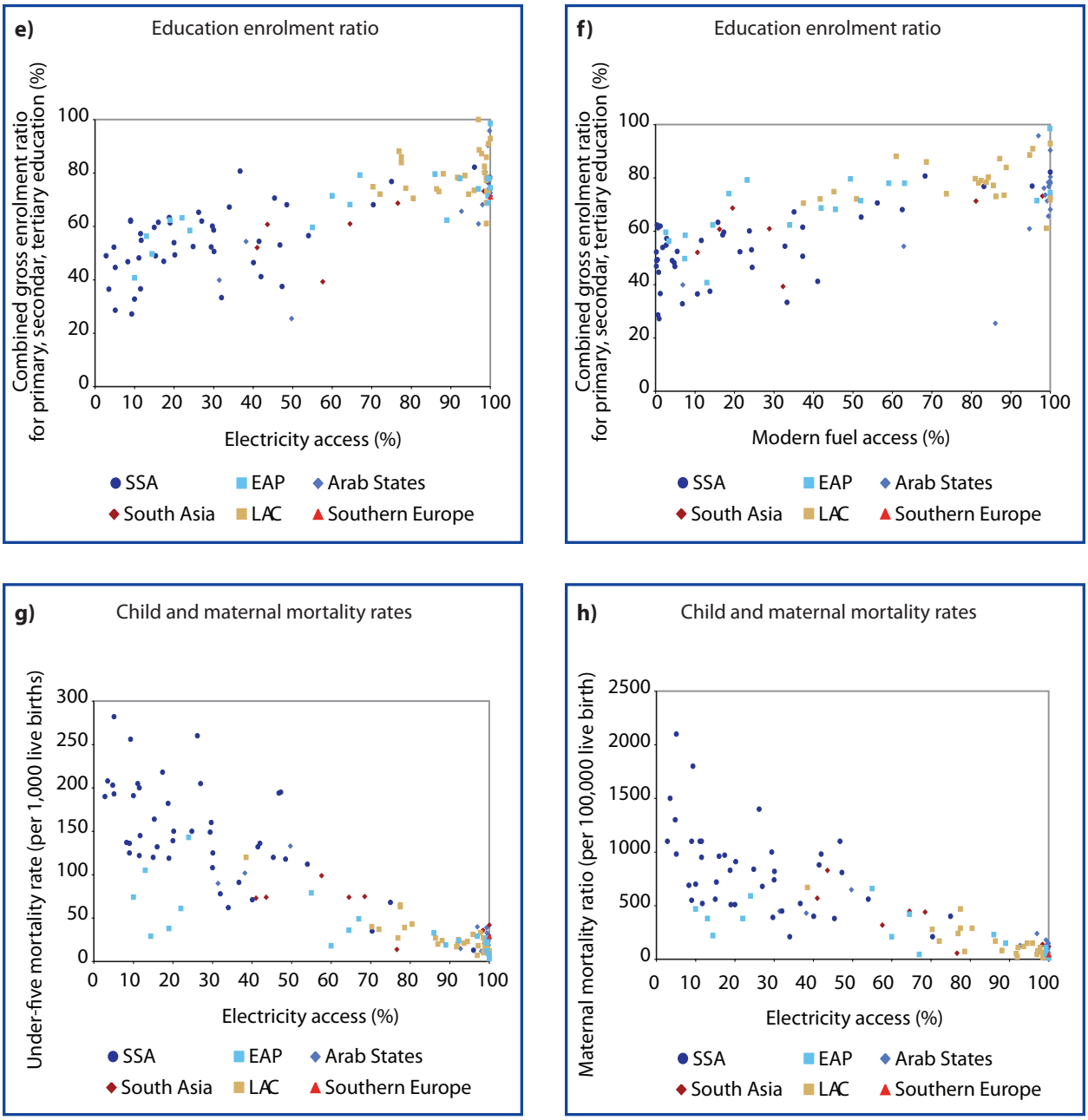
Figure 26. Development measures and energy access (a-d)



Sources: UNDP (2007), for information on population living on less than $1 and mortality rates and UNDP (2009) for data on HDI and combined gross education enrolment ratios.

Note: See Appendix 6 for energy access data by country.

Figure 26. Development measures and energy access (e-h)



Sources: UNDP (2007), for information on population living on less than $1 and mortality rates and UNDP (2009) for data on HDI and combined gross education enrolment ratios.

Note: See Appendix 6 for energy access data by country.

APPENDIX 2: COUNTRY CLASSIFICATIONS

UNDP classifies countries into three major groupings (UNDP 2007c):

- Developing countries - 140 countries or areas
- Central and Eastern Europe and the Commonwealth of Independent States - 28 countries or areas
- Organisation for Economic Co-operation and Development countries - 30 countries or areas

A. Developing countries

Among developing countries, UNDP has identified six regions, which as of early 2007 included the following number of countries or areas:

- Arab States - 20 countries or areas
- East Asia and the Pacific - 31 countries or areas
- South Asia - 9 countries or areas
- Latin America and the Caribbean - 33 countries or areas
- Southern Europe - 2 countries or areas
- Sub-Saharan Africa - 45 countries or areas

A list of the countries and their classifications is provided in Table 13.

Table 13. Developing country classification (as of early 2007)

Country	LDC	Sub-Saharan Africa	Arab States	East Asia and the Pacific	South Asia	Latin America & Caribbean	Southern Europe	OECD
Afghanistan	√				√			
Algeria			√					
Angola	√	√						
Antigua and Barbuda						√		
Argentina						√		
Bahamas						√		
Bahrain			√					
Bangladesh	√				√			
Barbados						√		
Belize						√		
Benin	√	√						
Bhutan	√				√			
Bolivia						√		

Country	LDC	Sub-Saharan Africa	Arab States	East Asia and the Pacific	South Asia	Latin America & Caribbean	Southern Europe	OECD
Botswana		√						
Brazil						√		
Brunei Darussalam				√				
Burkina Faso	√	√						
Burundi	√	√						
Cambodia	√			√				
Cameroon		√						
Cape Verde	√	√						
Central African Republic	√	√						
Chad	√	√						
Chile						√		
China				√				
Colombia						√		
Comoros	√	√						
Congo		√						
Congo (Dem. Rep. of the)	√	√						
Cook Islands				√				
Costa Rica						√		
Côte d'Ivoire		√						
Cuba						√		
Cyprus							√	
Djibouti	√		√					
Dominica						√		
Dominican Republic						√		
Ecuador						√		
Egypt			√					
El Salvador						√		
Equatorial Guinea	√	√						
Eritrea	√	√						
Ethiopia	√	√						
Fiji				√				
Gabon		√						
Gambia	√	√						
Ghana		√						
Grenada						√		
Guatemala						√		
Guinea	√	√						
Guinea-Bissau	√	√						
Guyana						√		
Haiti	√					√		
Honduras						√		
Hong Kong, China (SAR)				√				
India					√			

Country	LDC	Sub-Saharan Africa	Arab States	East Asia and the Pacific	South Asia	Latin America & Caribbean	Southern Europe	OECD
Indonesia				√				
Iran (Islamic Republic of)					√			
Iraq			√					
Jamaica						√		
Jordan			√					
Kenya		√						
Kiribati	√			√				
Korea (Dem People's Republic of)				√				
Korea (Republic of)				√				√
Kuwait			√					
Lao People's Democratic Republic	√			√				
Lebanon			√					
Lesotho	√	√						
Liberia	√	√						
Libya			√					
Madagascar	√	√						
Malawi	√	√						
Malaysia				√				
Maldives	√				√			
Mali	√	√						
Marshall Islands				√				
Mauritania	√	√						
Mauritius		√						
Mexico						√		√
Micronesia (Federated States of)				√				
Mongolia				√				
Morocco			√					
Mozambique	√	√						
Myanmar	√			√				
Namibia		√						
Nauru				√				
Nepal					√			
Nicaragua						√		
Niue				√				
Niger	√	√						
Nigeria		√						
Occupied Palestinian Territories			√					
Oman			√					
Pakistan					√			
Palau				√				
Panama						√		

Country	LDC	Sub-Saharan Africa	Arab States	East Asia and the Pacific	South Asia	Latin America & Caribbean	Southern Europe	OECD
Papua New Guinea				√				
Paraguay						√		
Peru						√		
Philippines				√				
Qatar			√					
Rwanda	√	√						
Saint Kitts and Nevis						√		
Saint Lucia						√		
Saint Vincent and the Grenadines						√		
Samoa	√			√				
Sao Tome and Principe	√	√						
Saudi Arabia			√					
Senegal	√	√						
Seychelles		√						
Sierra Leone	√	√						
Singapore				√				
Solomon Islands	√			√				
Somalia	√		√					
South Africa		√						
Sri Lanka				√				
Sudan	√		√					
Suriname						√		
Swaziland		√						
Syrian Arab Republic			√					
Tanzania (United Republic of)	√	√						
Thailand				√				
Timor-Leste	√			√				
Togo	√	√						
Tokelau				√				
Tonga				√				
Trinidad and Tobago						√		
Tunisia			√					
Turkey							√	√
Tuvalu	√			√				
Uganda	√	√						
United Arab Emirates			√					
Uruguay						√		
Vanuatu	√			√				

Country	LDC	Sub-Saharan Africa	Arab States	East Asia and the Pacific	South Asia	Latin America & Caribbean	Southern Europe	OECD
Venezuela (Bolivarian Republic)						√		
Viet Nam				√				
Yemen	√		√					
Zambia	√	√						
Zimbabwe		√						
Total number of countries	**50**	**45**	**20**	**31**	**9**	**33**	**2**	**3**

B. Least Developed Countries

In 2007, about 15 percent of the world's population (some 804 million people) lived in the Least Developed Countries (LDCs), the 50 poorest countries in the world. Countries are designated as LDCs if they fulfil the criteria described in Box 4.

Box 4. What is a Least Developed Country?

The list of Least Developed Countries (LDCs) is established by the UN's Economic and Social Council (ECOSOC), which reviews the list every 3 years. In classifying countries as LDCs, the Council uses criteria in three key areas: low income; weakness of human resources; and economic vulnerability.

Indicators used to assess countries relative to these criteria are:

(1) for the low-income criterion, a 3-year average estimate of the gross national income (GNI) per capita (i.e., under $750 for inclusion; above $900 for graduation)

(2) for the human resource weakness criterion, a composite Human Assets Index (HAI), composed of indicators related to nutrition, health, education, and adult literacy

(3) for the economic vulnerability criterion, a composite Economic Vulnerability Index (EVI), composed of indicators related to: instability of agricultural production; instability of exports of goods and services; economic importance of non-traditional activities (e.g., share of manufacturing and modern services in GDP); merchandise export concentration; handicap of economic smallness (as measured through the population in logarithm); and percentage of population displaced by natural disasters

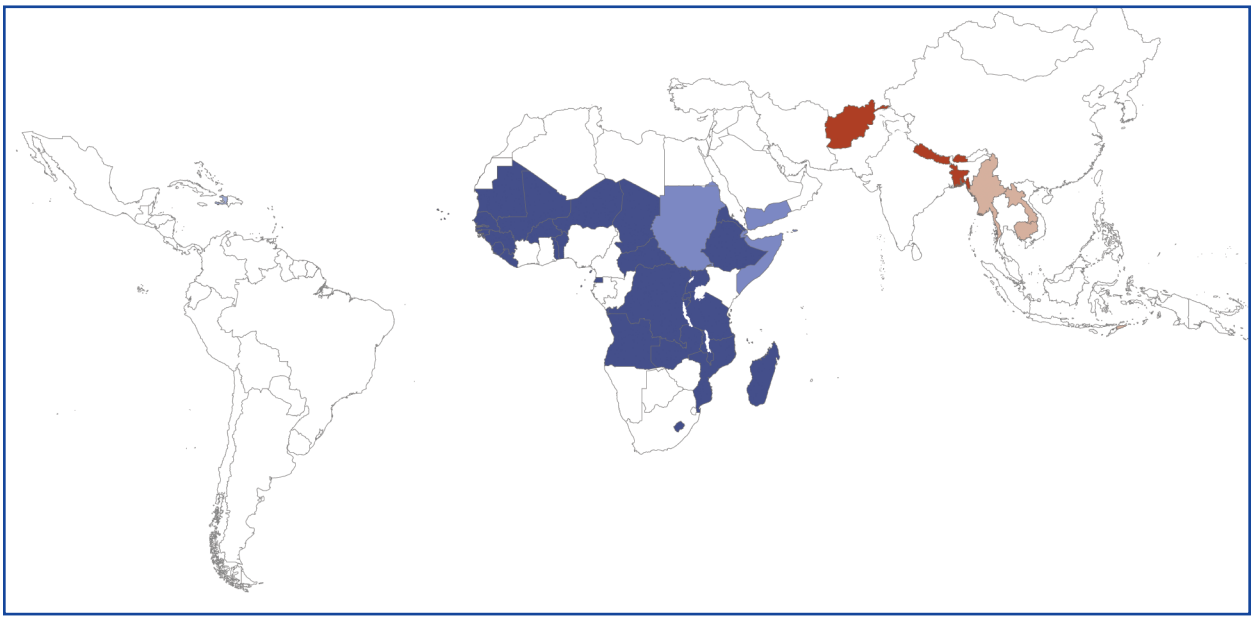
In addition, the population must not exceed 75 million, since 'the fundamental meaning of the LDC category, i.e., the recognition of structural handicaps, excludes large economies'.

To qualify for graduation, a country must meet the thresholds for two of the three criteria in two consecutive triennial reviews.

Source: UN (2007).

According to the UN Population Division, the population of LDCs (about 800 million in 2007, as noted above) could reach 970 million by 2015 and 1.3 billion by 2030. As of early 2007, there were 50 countries (or areas) classified as LDCs (Table 13 and Map 5).

Map 5. Map of the Least Developed Countries



Note: SSA countries are in dark blue, Arab States in blue, South Asia countries in red, East Asia & Pacific countries in light pink, and Latin America & Caribbean countries in light blue. Some small countries and islands may not appear in the map. The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations or UNDP concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

APPENDIX 3: HEALTH IMPACTS OF HOUSEHOLD ENERGY USE

A. Exposure to smoke and other risks

Numerous studies carried out in homes in developing countries of Asia, Africa, and the Americas have shown extremely high levels of indoor smoke pollution. Table 14 summarises the range of levels reported from these studies for particulate matter (PM10) and carbon monoxide (CO), compared to WHO air quality guidelines for these substances (WHO 2000, 2005).

The concentrations of particulate matter are typically at least 10 to 20 times higher than current WHO guidelines, and indeed much higher than the upper intermediate target (IT-1) proposed by WHO as an initial level for poorer countries to aim for (WHO 2005). Particulate matter damages human health in a number of ways, reflecting its chemical complexity. These include direct injury and irritation through deposition in the lungs, impairment of defences by disruption of immune cell functions, and so-called oxidative stress in the lungs and throughout the body due to absorption of the very smallest particles into the blood stream.

Although the current air quality guidelines are intended primarily for outdoor air quality management, there is no reason, based on the scientific evidence, for not applying these to air quality in homes polluted by smoke from solid fuel use (WHO 2005).

For carbon monoxide, recorded concentrations are generally near or somewhat higher than the guideline levels. Studies of blood levels of CO (measured by carboxy-haemoglobin) indicate exposures that are equivalent to light- to medium levels of active smoking or heavy levels of passive tobacco smoking. One of the main concerns with CO is exposure among pregnant women. In most societies, women continue their cooking duties throughout pregnancy and therefore continue to be exposed (along with their unborn child).

Table 14. Indoor levels of PM10 and CO from household combustion of solid fuels, compared with WHO air quality guidelines

Pollutant	Range of measured pollution levels in homes (usually kitchens) in developing-country studies of solid fuel use in simple stoves		WHO Air Quality Guidelines[36]		
	Period	Level	Period	Level	
Small particles (PM10) [µg/m3]	Annual	No studies have measured pollution levels over this long a period however, average levels over the course of a year are expected to be similar to measured 24-hour levels (i.e., most stoves are used daily).	Annual mean	Guideline	20
				IT-3	30
				IT-2	50
				IT-1	70
	24 hour	Wide range of recorded levels, from around 300 µg/m3 to 3,000 µg/m3 or more. Most range from 500 to 1,000 µg/m3.	24 hour mean (99th percentile: 3 days/year)	Guideline	50
				IT-3	75
				IT-2	100
				IT-1	150
	During stove use	Mostly range from 300 to 20,000+ µg/m3 although levels of 30,000+ µg/m3 have been recorded.			
Carbon monoxide [parts per million]	24 hour	Generally up to 10 ppm, but can exceed 50 ppm.	8 hour	10ppm	
	During stove use	Can exceed 100 ppm.	1 hour	30ppm	
			15 minutes	100ppm	
	Carboxy-haemoglobin (COHb) %	Level measured in range 1.5 - 13%	Recommended that COHb should not exceed 2.5%. Typical non-smoker 0.5 - 1.5%. Typical smoker 10%.		

Source: Updated from (Bruce et al. 2006)

[36] WHO Guidelines for Europe (WHO 2000) for CO and AQG Global Update (WHO 2005) for PM10. IT = Intermediate target (see text).

Table 15. Status of evidence linking household combustion of biomass fuels and coal with child and adult health outcomes[a]

Health outcome	Age group	Status of evidence
Sufficient evidence for burden-of-disease calculation		
Pneumonia	< 5 years	**Strong** Some 15–20 observational studies for each condition and one randomised controlled trial for child pneumonia, from developing countries. Evidence is consistent (i.e., significantly elevated risk in most, though not all, studies); effects are sizable, plausible, and supported by evidence from outdoor air pollution and smoking.
Chronic obstructive pulmonary disease	Adult women	
Lung cancer (coal exposure)	Adult women	
Chronic obstructive pulmonary disease	Adult men	**Moderate-I** Smaller number of studies, but consistent and plausible.
Lung cancer (coal exposure)	Adult men	
Not yet sufficient evidence for burden-of-disease calculation		
Lung cancer (biomass exposure)	Adult women	**Moderate-II** Adverse pregnancy outcomes include low birth weight and increased risk of stillbirth. Small number of studies not all consistent for all of these outcomes, but supported by studies of outdoor air pollution, smoking, and laboratory animals.
Tuberculosis	Adult	
Adverse pregnancy outcomes	Perinatal	
Cataracts	Adult	
Asthma	Adult and child	**Tentative** One or a few studies at most for each of these conditions not all consistent (especially for asthma, which may reflect variations in definitions and condition by age), but some support from outdoor air pollution and passive smoking studies.
Cancer of upper aero-digestive tract	Adult	
Interstitial lung disease	Adult	
Ischaemic heart disease	Adult	Dozens of studies covering other combustion smoke mixtures (ambient air pollution, active smoking, and passive smoking) find consistent risks at higher and lower dose levels, but none so far in developing countries, other than one showing impact on blood pressure.
Strong evidence: Many studies of solid fuel use in developing countries, supported by evidence from studies of active and passive smoking, urban air pollution, and biochemical or laboratory studies. **Moderate evidence:** At least three studies of solid fuel use in developing countries, supported by evidence from studies on active smoking and on animals. Moderate I: strong evidence for specific age/sex groups. Moderate II: limited evidence.		

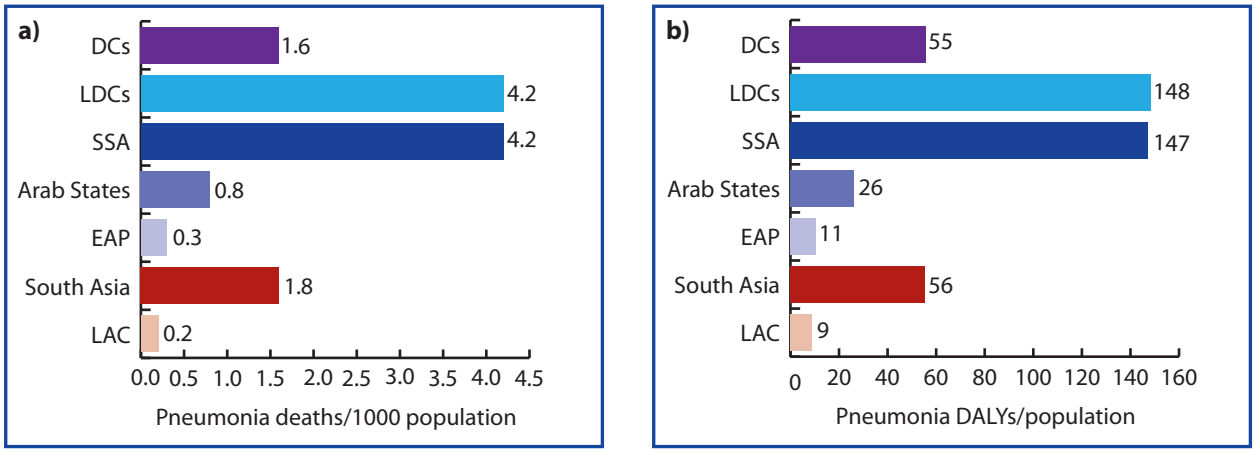
Note: a. Based on the systematic reviews and standardised assessment of evidence employed for the WHO 2002 Comparative Risk Assessment. Reviews of many of these outcomes are currently underway for the 2005 GBD update, and the status of this evidence will be revised by WHO when these reviews are available.

Disease burden in developing regions, by cause

For the three conditions—child pneumonia, COPD, and lung cancer—patterns of disease burden resulting from solid fuel use are strongly influenced by variations among regions and countries in underlying disease rates, as well as (in the case lung cancer) the use of coal as a common household fuel in a few countries.

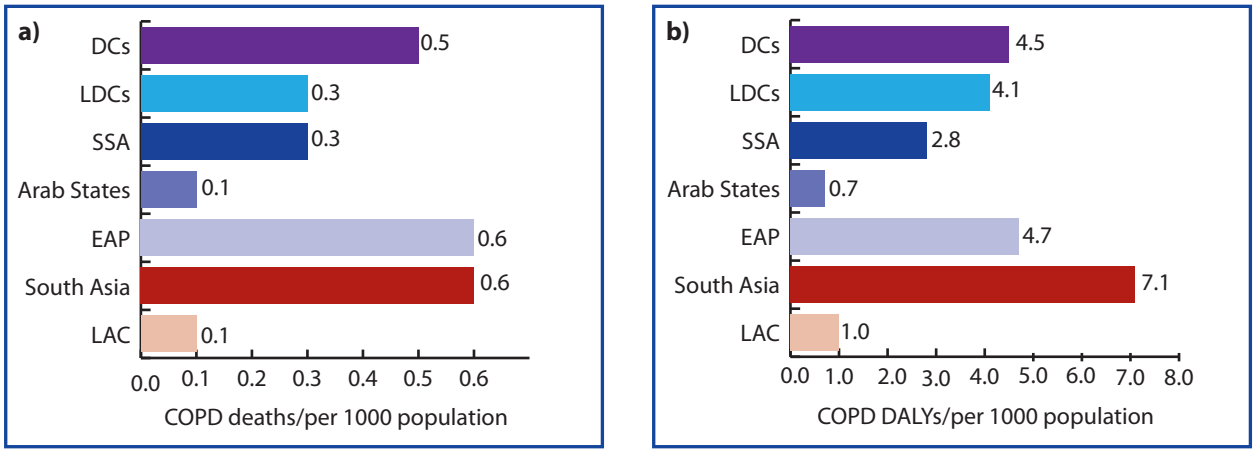
For child pneumonia, which is most common in LDCs, Figure 27 shows that solid fuel use is responsible for much higher rates of deaths and DALYs in LDCs and sub-Saharan Africa than elsewhere. Among the other regions, South Asia has the next highest rates.

Figure 27. (a) Attributable deaths from pneumonia < 5 years / 1000 capita, and (b) attributable DALYs from pneumonia < 5 years / 1000 capita



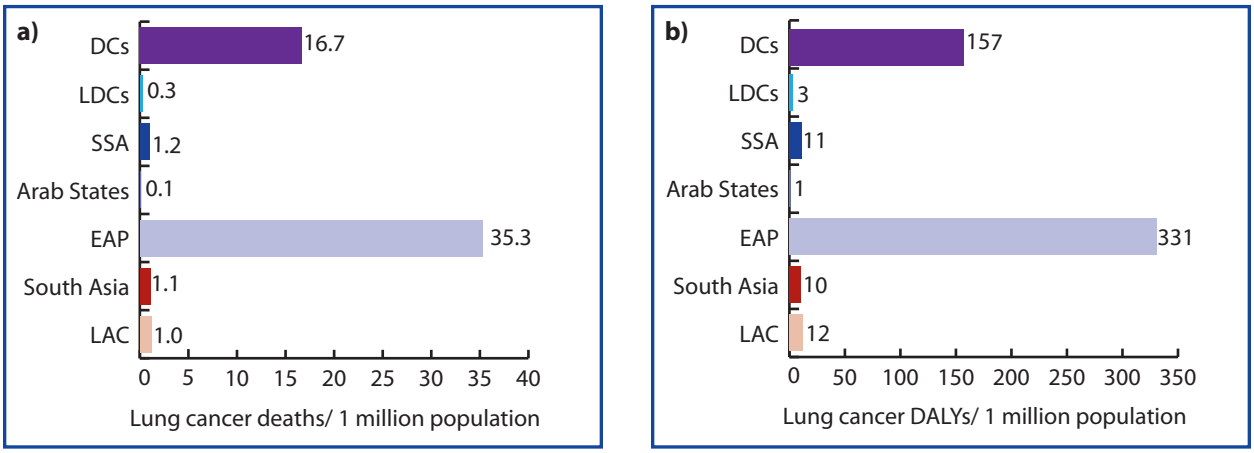
For COPD, Figure 28 shows that solid fuel use has the greatest impact on rates of COPD deaths and DALYs in South Asia and East Asia & the Pacific (EAP), where this disease is more common than in other developing regions.

Figure 28. (a) Attributable deaths from COPD > 30 years / 1000 capita, and (b) attributable DALYs from COPD > 30 years / 1000 capita



The situation for lung cancer is rather different, due to the concentration of coal use as a household fuel in relatively few developing countries, including in one very large country, China. Consequently, the highest rates by far of deaths and DALYs resulting from solid fuel use occur in EAP (Figure 29).

Figure 29. (a) Attributable deaths and (b) DALYs from lung cancer, in adults > 30 years / 1 million population

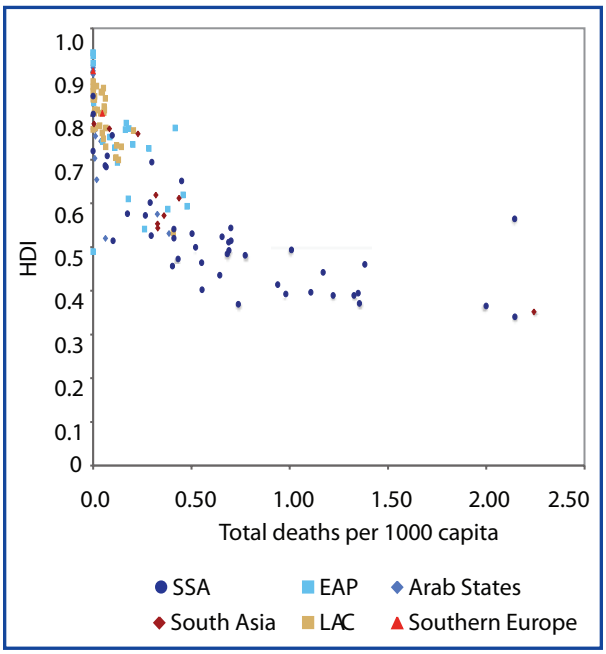


Disease burden and poverty

Overall, for all three diseases together, poverty—expressed by the HDI—is closely associated with disease burden attributable to solid fuel use (Figure 30), and the countries with the highest burdens are mainly those in sub-Saharan Africa.

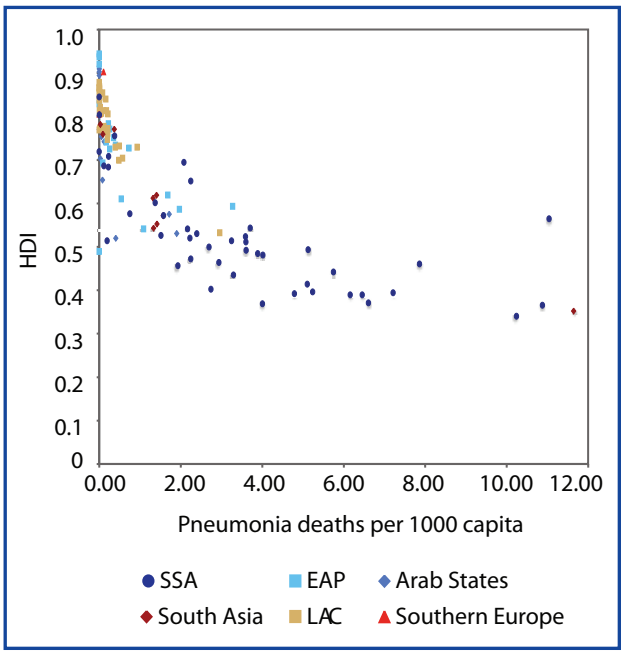
For child pneumonia (Figure 31), a similar association is seen, but somewhat stronger and with much higher attributable death rates in the poorest countries, particularly in sub-Saharan Africa. This is a consequence of several factors, including high underlying incidence of child pneumonia, high mortality rate for cases of pneumonia (case fatality), and the very high reliance on solid fuels for household use in the poorest countries.

Figure 30. Human Development Index 2007 versus death rates attributable to solid fuel use (all causes)



Source: UNDP (2009) for data on HDI 2007

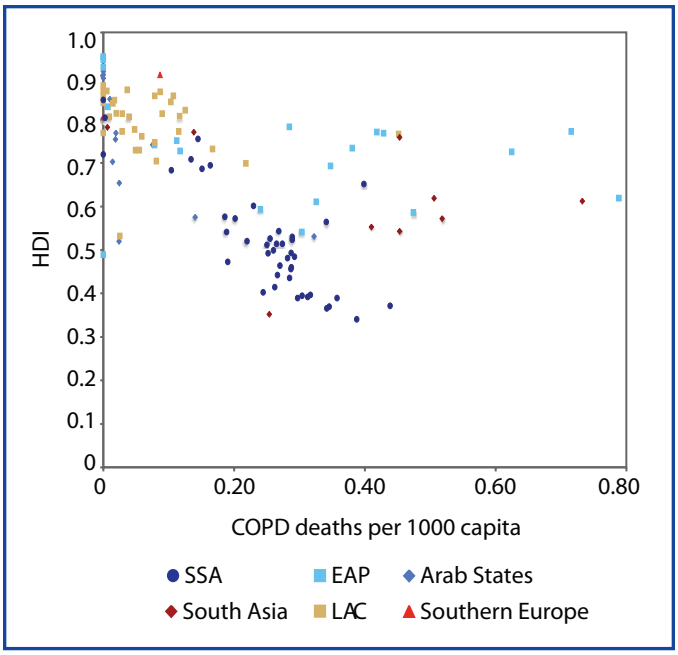
Figure 31. Human Development Index 2007 versus death rates attributable to pneumonia from solid fuel use



Source: UNDP (2009) for data on HDI 2007

The relationship between attributable burden of COPD and poverty (Figure 32) is more complex, due to the fact that the poorest countries (LDCs, sub-Saharan Africa) do not have the highest underlying rates of COPD, particularly for women. This contrasts with the situation for child pneumonia. Consequently, the countries with the highest COPD death rates attributable to solid fuel use have mid-range HDI values, and are in EAP and South Asia.

Figure 32. Human Development Index 2007 versus attributable COPD deaths from solid fuel use



Source: UNDP (2009) for data on HDI 2007

Disease burden in developing countries, by cause

For the three conditions, child pneumonia, COPD and lung cancer, patterns of health burden resulting from solid fuel use are strongly influenced by variations between regions and countries in disease rates and additionally - for lung cancer – the countries where coal is used commonly as a household fuel.

Table 16. Numbers of deaths for pneumonia, COPD and lung cancer attributable to solid fuel use, by country, 2004[37a]

Country	Pneumonia	Chronic Obstructive Pulmonary disease	Lung cancer[c]	All deaths
	Children <5 years	Adults >30 years	Adults >30 years	
Afghanistan	52,400	1,600	—	54,000
Algeria	200	200	—	400
Angola	32,100	1,400	—	33,500
Antigua and Barbuda	—	—	—	—
Argentina	—	—	—	—
Bahamas	—	—	—	—
Bahrain	—	—	—	—
Bangladesh	25,000	24,400	—	49,400

[37] From WHO 2009, Country profiles of environmental burden of disease, accessible at www.who.int/quantifying_ehimpacts/countryprofiles .

Country	Pneumonia	Chronic Obstructive Pulmonary disease	Lung cancer[c]	All deaths
	Children <5 years	Adults >30 years	Adults >30 years	
Barbados	—	—	—	—
Belize	—	—	—	—
Benin	5,100	600	—	5,700
Bhutan	<100	100	—	200
Bolivia	1,100	200	—	1,300
Botswana	500	<100	—	500
Brazil	3,200	7,300	300	10,700
Burkina Faso	15,300	1,200	—	16,500
Burundi	9,600	600	—	10,200
Cambodia	5,500	1,100	—	6,600
Cameroon	9,900	1,500	—	11,400
Cape Verde	—	—	—	<100
Central African Republic	2,600	400	—	3,000
Chad	8,800	800	—	9,600
Chile	—	—	—	—
China	9,100	505,900	33,900	548,900
Colombia	300	2,200	—	2,400
Comoros	<100	<100	—	100
Congo	800	200	—	1,000
Congo (DR)	71,200	4,400	—	75,600
Cook Islands	—	—	—	—
Costa Rica	—	200	—	200
Côte d'Ivoire	10,900	1,500	<100	12,500
Cuba[b]	—	600	—	600
Cyprus	—	—	—	—
Djibouti	<100	—	—	<100
Dominica[b]	—	—	—	—
Dominican Republic	100	200	—	300
Ecuador	<100	<100	—	<100
Egypt	200	400	—	600

Country	Pneumonia	Chronic Obstructive Pulmonary disease	Lung cancer[c]	All deaths
	Children <5 years	Adults >30 years	Adults >30 years	
El Salvador	200	200	—	300
Eritrea	1,700	200	—	1,900
Ethiopia	66,700	5,700	—	72,400
Fiji	—	<100	—	<100
Gabon	<100	<100	—	100
Gambia	500	100	—	600
Ghana	7,800	1,800	—	6,500
Grenada[b]	—	—	—	—
Guatemala	1,200	300	—	1,400
Guinea	4,900	700	—	5,700
Guinea-Bissau	1,600	100	—	1,700
Guyana	<100	—	—	<100
Haiti	3,700	<100	—	3,700
Honduras	500	300	—	800
India	167,900	319,700	600	488,200
Indonesia	8,700	36,600	—	45,300
Iran	200	200	—	300
Iraq	500	100	—	600
Jamaica	<100	500	—	500
Jordan	—	—	—	—
Kenya	12,500	1,700	—	14,300
Korea (Rep.)	—	—	—	—
Kuwait	—	—	—	—
Lao People's Democratic Republic	1,200	1,300	—	2,600
Lebanon	—	—	—	—
Lesotho	<100	100	—	200
Liberia	3,700	200	—	3,900
Libyan Arab Jamahiriya	—	<100	—	<100
Madagascar	11,300	1,400	—	12,700
Malawi	12,100	1,000	—	13,000

Country	Pneumonia	Chronic Obstructive Pulmonary disease	Lung cancer[c]	All deaths
	Children <5 years	Adults >30 years	Adults >30 years	
Malaysia	—	<100	—	<100
Maldives	—	—	—	<100
Mali	14,100	1,200	—	15,300
Marshall Islands	—	—	—	—
Mauritania	1,000	200	—	1,200
Mauritius	—	—	—	—
Mexico	900	3,400	—	4,300
Micronesia	—	—	—	—
Mongolia	200	100	—	300
Morocco	200	300	—	500
Mozambique	9,700	1,400	—	11,100
Myanmar	8,300	9,800	—	18,100
Namibia	<100	<100	—	100
Nauru	—	—	—	—
Nepal	5,100	3,600	—	8,700
Nicaragua	300	400	—	700
Niger	26,100	1,400	—	27,500
Nigeria	85,600	9,600	—	95,300
Niue	—	—	—	—
Oman	—	—	—	—
Pakistan	29,800	26,300	<100	56,100
Palau	—	—	—	—
Panama[b]	<100	100	—	200
Papua New Guinea	1,000	600	—	1,600
Paraguay	200	100	—	300
Peru	600	400	—	1,000
Philippines	3,800	3,300	<100	7,200
Qatar	—	—	—	—
Rwanda	11,900	600	—	12,500
Saint Kitts and Nevis	—	—	—	—

Country	Pneumonia	Chronic Obstructive Pulmonary disease	Lung cancer[c]	All deaths
	Children <5 years	Adults >30 years	Adults >30 years	
Saint Lucia	—	—	—	—
Saint Vincent and the Grenadines[b]	—	—	—	—
Samoa	—	<100	—	<100
Sao Tome and Principe[b]	<100	—	—	<100
Saudi Arabia	—	—	—	—
Senegal	5,400	900	—	6,300
Seychelles	—	—	—	—
Sierra Leone	10,200	600	—	10,800
Singapore	—	—	—	—
Solomon Islands	<100	<100	—	<100
Somalia[b]	10,600	700	—	11,300
South Africa	1,200	1,900	<100	3,200
Sri Lanka	100	4,200	—	4,300
Sudan	10,300	3,600	—	13,900
Swaziland	200	<100	—	300
Syrian Arab Republic	300	400	—	700
Tanzania	15,900	3,000	—	18,900
Thailand	1,000	9,500	—	10,500
Togo	2,700	400	—	3,200
Tonga	—	—	—	—
Trinidad and Tobago	—	—	—	—
Tunisia	<100	<100	—	100
Turkey[b]	700	2,700	—	3,400
Tuvalu	—	—	—	—
Uganda	17,900	1,800	<100	19,700
United Arab Emirates	—	—	—	—
Uruguay	—	—	—	—
Vanuatu	—	<100	—	<100
Venezuela[b]	<100	200	—	200

Country	Pneumonia	Chronic Obstructive Pulmonary disease	Lung cancer[c]	All deaths
	Children <5 years	Adults >30 years	Adults >30 years	
Viet Nam	2,000	21,100	700	23,800
Yemen	6,000	700	—	6,700
Zambia	7,900	800	—	8,700
Zimbabwe	2,900	1,000	—	3,800

Note: Solid fuels refer to traditional biomass - wood, charcoal, dung, straw, crop residues, etc - and coal. The sign "-" means zero or estimation or method not sensitive enough. Figures have been computed by WHO to ensure compatibility; thus they are not necessarily the official statistics of Member States, which may use alternative rigourous methods. The number of deaths attributable to indoor air pollution from solid fuel use were calculated without the prior removal of chronic obstructive pulmonary disease and lung cancer deaths attributable to smoking, thus leading to higher figures than previously reported. (a) The percentages of population using solid fuels (SFU) used as exposure measure to calculate the present death figures are published in (WHO 2006)[38] and in the WHO Country profiles of environmental burden of disease (WHO 2009b). There are different from the figures for solid fuels presented in Annex 6; (b) For these countries, no recent SFU data are presented in Annex 6, but older figures exist (see references mentioned in (a)); (c) Evidence for lung cancer is only available when coal is used.

Table 17. Number of DALYs per 1000 capita for pneumonia, COPD and lung cancer attributable to solid fuel use, by country, 2004[39]

Country	Pneumonia	Chronic Obstructive Pulmonary disease	Lung cancer[c]	All DALYs
	Children <5 years	Adults >30 years	Adults >30 years	
Afghanistan	414	4.3	—	78
Algeria	1.8	0.2	—	0.2
Angola	385	5.0	—	73
Antigua and Barbuda	1.6	0.6	—	0.4
Argentina	—	—	—	—
Bahamas	—	—	—	—
Bahrain	—	—	—	—
Bangladesh	47	5.9	—	8
Barbados	—	—	—	—
Belize	9.7	1.9	—	1.9
Benin	126	3.0	—	23
Bhutan	49	5.8	—	7
Bolivia	34	0.5	—	5
Botswana	73	1.6	—	9
Brazil	7.8	1.5	0.03	1.4

[38] WHO 2006, Fuel for Life - Household energy and Health, National burden of disease estimates 2007, www.who.int/indoorair/publications/nationalburden.

[39] From WHO 2009, Country profiles of environmental burden of disease, accessible at www.who.int/quantifying_ehimpacts/countryprofiles .

Country	Pneumonia	Chronic Obstructive Pulmonary disease	Lung cancer[c]	All DALYs
	Children <5 years	Adults >30 years	Adults >30 years	
Burkina Faso	216	3.5	0.01	41
Burundi	251	3.3	—	45
Cambodia	123	2.8	—	16
Cameroon	125	3.1	—	21
Cape Verde	7.8	1.1	—	1.4
Central African Republic	141	3.4	—	23
Chad	167	3.7	0.04	32
Chile	—	—	—	—
China	4	5.0	0.45	3
Colombia	2.5	1.4	—	0.9
Comoros	26	2.1	0.00	5
Congo	48	2.2	0.09	8
Congo (DR)	225	3.3	—	44
Cook Islands	4.1	0.8	—	0.8
Costa Rica	0.9	0.7	—	0.4
Côte d'Ivoire	137	3.5	0.09	0.9
Cuba[b]	1	1.4	—	—
Cyprus	—	—	—	22
Djibouti	14	0.2	—	2.0
Dominica[b]	1.1	0.4	—	0.3
Dominican Republic	5.2	0.7	0.02	0.9
Ecuador	0.9	0.1	0.00	0.1
Egypt	0.9	0.2	—	0.2
El Salvador	9.0	1.0	—	1.4
Eritrea	78	1.9	0.01	14
Ethiopia	177	2.7	—	31
Fiji	7.8	0.9	—	1.2
Gabon	13	1.3	—	2.1
Gambia	67	3.0	—	12

Country	Pneumonia	Chronic Obstructive Pulmonary disease	Lung cancer[c]	All DALYs
	Children <5 years	Adults >30 years	Adults >30 years	
Ghana	54	2.4	0.00	8
Grenada[b]	6.2	2.4	—	1.5
Guatemala	21	0.9	0.00	4
Guinea	114	3.4	—	20
Guinea-Bissau	183	3.6	—	37
Guyana	17	1.2	—	2.4
Haiti	111	0.6	—	15
Honduras	22	2.4	—	4
India	47	7.9	0.01	8
Indonesia	16	5.9	—	4
Iran	1.1	0.1	—	0.1
Iraq	4.5	0.2	—	0.8
Jamaica	6.5	3.8	—	2.3
Jordan	—	—	—	—
Kenya	76	1.7	—	13
Korea (Rep.)	—	—	—	—
Kuwait	—	—	—	—
Lao People's Democratic Republic	62	9.2	0.00	11
Lebanon	—	—	—	—
Lesotho	6.8	2.1	—	1.5
Liberia	200	3.4	—	39
Libyan Arab Jamahiriya	0.7	0.2	—	0.2
Madagascar	130	2.9	—	23
Malawi	178	2.7	0.00	33
Malaysia	0.1	0.1	—	0.0
Maldives	13	0.9	—	1.6
Mali	232	3.9	0.00	45
Marshall Islands	20	2.7	—	3
Mauritania	78	2.1	0.06	13

Country	Pneumonia	Chronic Obstructive Pulmonary disease	Lung cancer[c]	All DALYs
	Children <5 years	Adults >30 years	Adults >30 years	
Mauritius	0.1	0.0	—	0.0
Mexico	3.7	0.8	0.00	0.7
Micronesia	13	2.8	—	2.7
Mongolia	27	1.9	—	3
Morocco	2.8	0.3	0.00	0.4
Mozambique	95	2.5	—	17
Myanmar	74	6.0	—	9
Namibia	4.0	1.3	0.00	0.9
Nauru	0.3	0.0	—	0.0
Nepal	50	5.2	—	8
Nicaragua	18	1.6	—	3
Niger	355	4.2	—	72
Nigeria	128	3.0	—	23
Niue	8.4	1.2	—	1.5
Oman	—	—	—	—
Pakistan	56	6.0	0.00	9
Palau	—	—	—	—
Panama[b]	7.4	1.0	—	1.2
Papua New Guinea	48	4.3	—	9
Paraguay	9.3	0.8	0.00	1.4
Peru	7.9	0.3	—	1.0
Philippines	14.0	1.9	0.03	2.5
Qatar	—	—	—	—
Rwanda	274	3.1	0.00	46
Saint Kitts and Nevis	—	—	—	—
Saint Lucia	2.1	2.4	—	1.2
Saint Vincent and the Grenadines[b]	1.5	0.7	—	0.4
Samoa	12	3.8	—	3
Sao Tome and Principe[b]	77	3.1	—	13
Saudi Arabia	—	—	—	—
Senegal	104	2.4	0.01	17

Country	Pneumonia	Chronic Obstructive Pulmonary disease	Lung cancer[c]	All DALYs
	Children <5 years	Adults >30 years	Adults >30 years	
Seychelles	—	—	—	—
Sierra Leone	380	4.5	—	67
Singapore	—	—	—	—
Solomon Islands	23	3.4	—	5
Somaliab	256	3.9	—	48
South Africa	7.9	1.2	0.05	1.3
Sri Lanka	4	6.0	—	3
Sudan	66	3.1	—	11
Swaziland	55	2.0	0.01	8
Syrian Arab Republic	4.8	1.4	—	1.1
Tanzania	84	3.1	—	16
Thailand	8.7	2.3	—	1.9
Togo	95	2.9	—	17
Tonga	8.6	3.6	—	2.2
Trinidad and Tobago	0.4	0.2	—	0.1
Tunisia	1.2	0.3	0.02	0.2
Turkeyb	3.6	0.9	—	0.7
Tuvalu	11	3.0	—	2.5
Uganda	114	2.7	0.07	23
United Arab Emirates	—	0.0	—	—
Uruguay	0.1	0.1	—	0.0
Vanuatu	4.4	3.5	—	1.8
Venezuela[b]	0.7	0.3	—	0.2
Viet Nam	10	4.6	0.17	3
Yemen	61	2.3	—	11
Zambia	142	2.8	0.00	26
Zimbabwe	59	2.7	—	8

Note: Solid fuels refer to traditional biomass - wood, charcoal, dung, straw, crop residues, etc - and coal. The sign "-" means zero or estimation or method not sensitive enough. Figures have been computed by WHO to ensure compatibility; thus they are not necessarily the official statistics of Member States, which may use alternative rigourous methods. The number of DALYs attributable to indoor air pollution from solid fuel use were calculated without the prior removal of chronic obstructive pulmonary disease and lung cancer DALYs attributable to smoking, thus leading to higher figures than previously reported. (a) The percentages of population using solid fuels (SFU) used as exposure measure to calculate the present DALYs figures are published in (WHO 2006)[40] and in the WHO Country profiles of environmental burden of disease (WHO 2009b). There are different from the figures for solid fuels presented in Annex 6; (b) For these countries, no recent SFU data are presented in Annex 6, but older figures exist (see references mentioned in (a)); (c) Evidence for lung cancer is only available when coal is used; d) The rates are calculated for the total population (all ages).

[40] WHO 2006, Fuel for Life - Household energy and Health, National burden of disease estimates 2007, www.who.int/indoorair/publications/nationalburden.

APPENDIX 4: GLOBAL AND REGIONAL MDG-RELATED ENERGY TARGETS

A. Global targets

Various organisations and institutions have made suggestions for global MDG-related energy access targets, which are listed below and were obtained from GNESD (2007). They are:

UN Millennium Project

- Enable the use of modern fuels for 50 percent of those who at pres¬ent use traditional biomass for cooking. In addition, support (a) efforts to develop and adopt the use of improved cooking stoves, (b) measures to reduce the adverse health impacts from cooking with biomass, and (c) measures to increase sustainable biomass production.
- Ensure reliable access to electricity to all in urban and peri-urban areas.
- Provide access to modern energy services (in the form of mechanical power and electricity) at the community level for all rural communities.

International Energy Agency

- Reduce the number of people without access to electricity to no more than 1 billion by 2015.
- Reduce the number of people reliant on traditional biomass to 1.85 billion by 2015.

GTZ

- Double consumption of modern energy services, especially for productive uses.
- Provide access to modern cooking energy services for 50 percent of the African people living in rural areas and using traditional biomass for cooking.
- Enable access to reliable and affordable modern energy services for basic energy needs for 75 percent of the urban and peri-urban poor.
- Provide access to 75 percent environment-friendly electricity for schools, health facilities, and community centres.
- Promote motive power for productive uses within all major rural communities.

McKinsey and Company

- Reduce by half, between 2005 and 2015, the proportion of urban and rural households without access to adequate lighting.
- Reduce by half, between 2005 and 2015, the proportion of urban and rural households reliant on cooking methods that are not MDG-compatible.
- Provide adequate, clean, and efficient energy services by 2015 to all educational and health facilities.

Stockholm Environment Institute

- The Stockholm Environment Institute elaborated on the McKinsey and Company targets and defined the following targets to be achieved by 2015:

- Enable use of modern fuels for 50 percent of those who at present use traditional biomass for cooking.
- Enable access to reliable modern energy services for all urban and peri-urban poor.
- Provide electricity for all schools, clinics, hospitals, and community centres.
- Enable access to mechanised power for all communities.

B. Regional targets for sub-Saharan Africa

Regional organisations for sub-Saharan Africa have also proposed targets for countries in their regions to adopt. These are:

Forum of Energy Ministers of Africa (FEMA) Position Paper (2005)

- 50 percent of Africans living in rural areas and using traditional biomass for cooking should have access to modern energy services such as improved cook stoves which reduce indoor air pollution as well as efficient kerosene and gas stoves.
- 50 percent of urban and peri-urban poor should have access to reliable and affordable modern energy services for their basic energy needs such as cooking and lighting; and productive uses such as agro processing and general value addition.
- 50 percent of schools, clinics, and community centres should have access to modern electricity services for provision of lighting, refrigeration, information and communication technology.

Economic Community of West African States (ECOWAS) White Paper (2006)

- 100 percent of the total populations or 325 million people will have access to a modern cooking fuel.
- At least 60 percent of people living in rural areas will have access to productive energy services in villages, in particular motive power to boost the productivity of economic activities.
- 66 percent of the population, or 214 million people, will have access to an individual electricity supply, or 100 percent of urban and peri-urban areas, 36 percent of rural populations, and moreover, 60 percent of the rural population will live in localities with:
  - modernised basic social services: health care, drinking water, communication, etc.
  - access to lighting, audiovisual and telecommunication service, etc. and
  - the coverage of isolated populations with decentralised approaches.

East African Community (EAC) Energy Access Strategy (2007)

- 55 percent of the total population in the region will have access to LPG or improved stoves and to sustained biomass supply. This is the equivalent of an additional 50 percent of the population that currently does not have access to modern cooking practices.
- 100 percent of urban and peri-urban households will be provided with an electricity service.
- 100 percent of the rural population will live in a locality where social service centres are equipped with modern energy services.
- 100 percent of administrative headquarters and localities with more than 3,500 inhabitants will be equipped with mechanical power and heating technology.

Southern African Development Community (SADC) Regional Indicative Strategic Development Plan (undated)

- 70 percent of rural communities have access to electricity (by 2018), or
- 70 percent of rural communities have access to modern forms of energy supplies (by 2018).

Economic and Monetary Community of Central Africa (CEMAC) Energy Plan Action (2006)

- 50 percent of the population have electricity access, with at least 35 percent of the rural population having access.
- 80 percent of the peri-urban and rural population have improved access to modern fuels for cooking and heating.

APPENDIX 5: COMPARISON OF SCENARIOS OF ENERGY ACCESS IN 2015

In the 2004 and 2006 editions of its *World Energy Outlook*, the International Energy Agency (IEA) estimated energy access in 2015. Those projections differ somewhat from the estimates developed for this report. As noted earlier, this report focuses on the Least Developed Countries (LDCs) and sub-Saharan Africa, a main distinction. The following presents an overview of the IEA's estimates, noting other key similarities and differences with the estimates developed for this report.

The IEA estimates the number of people in developing countries relying on traditional biomass and the number with access to electricity in 2015 and 2030. These projections take into account fuel substitution and market penetration of more efficient technologies that would occur as a result of rising per capita incomes, as well as fuel availability and other factors, a key difference from the scenarios developed for this report. In addition, the IEA's estimates are based on the agency's own definition of developing countries (i.e., all countries that are not OECD countries or transition economies), which differs from the UNDP system of country and regional classification used for this report.[41] The IEA's estimates also make use of different baseline years.

Electricity. In the IEA's Reference Scenario, which estimates energy access under continuation of present policies through 2015, the number of people without access to electricity in 2015 is projected to be just under 1.6 billion. This is roughly the same as the number of people currently lacking access to electricity; however, given increased population, this translates roughly into an additional 600 million people with electricity access.

To achieve the Millennium Development Goal of halving the number of people living on less than $1 a day, the IEA estimates that the number of people without electricity access needs to be reduced to 1 billion or less. Given population growth, this translates into about 1.2 billion people who gain access to electricity by 2015, according to our calculations. This result is similar to the estimate of 1.2 billion additional people that will require electricity access by 2015 under the MDG-Compatible Scenario developed for this report.

Traditional biomass and modern fuels. In the IEA's Reference Scenario, the number of people in developing countries who rely on traditional biomass for cooking rises from 2.5 billion in 2004 to 2.6 billion in 2015. Given population increases, this translates roughly to 500 million people who no longer rely on traditional biomass in 2015.

According to the IEA's analysis, meeting the 2015 target of reducing by half the number of people relying on traditional biomass would mean that 1.3 billion people in developing countries switch from traditional biomass to LPG for cooking and heating (IEA 2006). In this report, we estimate that 1.9 billion additional people will require access to modern fuels (excluding traditional biomass and coal) in 2015 if the number of those without access is to be halved.

[41] See Appendix 2 for a complete listing of the UNDP country and regional classifications used in this report.

There are several reasons for the large difference (i.e., 600 million) in the two estimates. First, the IEA's estimate uses LPG used as a proxy for all modern fuels. In this report, we define modern fuels to include electricity and all liquid and gaseous fuels used for cooking. Moreover, our analysis includes a large number of people currently using coal (a solid fuel) for cooking who make the switch to modern, non-solid fuels, while the IEA focuses on those relying on traditional biomass. This accounts for most of the divergence in estimates.

The differing country classifications also account for some of the divergence in the estimates. The UN/UNDP classification system used for this report includes some relatively large countries, such as Mexico and Turkey, which are excluded (along with other OECD countries) from the IEA's analysis. Considering the methodological differences, the two estimates are broadly consistent.

APPENDIX 6: TABLES ON ENERGY ACCESS IN DEVELOPING COUNTRIES

Table 18. Electricity access, by country

Country	% of population with electricity access						Source(s)
	National	Year	Rural	Year	Urban	Year	
Afghanistan	14.4	*2008*	12	*2008*	22	*2008*	IEA, 2009[2]
Algeria	99.3	*2008*	98	*2008*	100	2008	IEA, 2009[2]
Angola	26.2	*2008*	10.7	*2008*	38	*2008*	IEA, 2009[2]
Antigua and Barbuda	>95	2006	>95	2006	>95	2006	Antigua & Barbuda Statistics Division of the Ministry of Finance and The Economy, 2004, Estimates
Argentina	97.2	*2008*	70	*2008*	99.6	*2008*	IEA, 2009[2]
Bahamas					94	2001	Mycoo M. (not dated)
Bahrain	99.4	*2008*	95	*2008*	100	*2008*	IEA, 2009[2]
Bangladesh	41	*2008*	28	*2008*	76	*2008*	IEA, 2009[2]
Barbados	100	*2004*	*100*	*2004*	*100*	*2004*	Castalia, 2004
Belize	91.7	2007	68	2000	95.4	2000	Statistical Institute of Belize, 2007; Central Statistical Office (not dated)
Benin	24.8	*2008*	8.5	*2008*	48	*2008*	IEA, 2009[2]
Bhutan	68.5	2007	56.1	2007	97.4	2007	National Statistics Bureau, Royal Government of Bhutan, 2007
Bolivia	77.5	*2008*	38	*2008*	98.2	*2008*	IEA, 2009[2]
Botswana	45.4	*2008*	12	*2008*	68	*2008*	IEA, 2009[2]
Brazil	97.8	*2008*	88	*2008*	99.5	*2008*	IEA, 2009[2]
Brunei	99.7	*2008*	98.6	*2008*	100	*2008*	IEA, 2009[2]
Burkina Faso	10	*2008*	6.3	*2008*	25	*2008*	IEA, 2009[2]
Burundi	2.8	*2006*	0.1	*2006*	25.6	*2006*	African Development Bank Group, 2007
Cambodia	24	*2008*	12.5	*2008*	66	*2008*	IEA, 2009[2]
Cameroon	29.4	*2008*	9	*2008*	45	*2008*	IEA, 2009[2]
Cape Verde	70.4	2006	44.9	2006	87.5	2006	Republic of Cape Verde, Ministry of Finance and Public Administration, 2008
Central African Rep.	5.1	2003	0.3	2003	14.7	2003	République Centrafricaine, Direction Générale de la Statistique, des Études Économiques et Sociales, 2005

Country	% of population with electricity access						Source(s)
	National	Year	Rural	Year	Urban	Year	
Chad	3.5	2004	0.3	2004	16.4	2004	Bandoumal O., Nodjimadji K. et al., 2004
Chile	98.5	*2008*	95	*2008*	99	*2008*	IEA, 2009[2]
China	99.4	*2008*	99	*2008*	100	*2008*	IEA, 2009[2]
Colombia	93.6	*2008*	76	*2008*	99.6	*2008*	IEA, 2009[2]
Comoros	40.1	2004					Lachaud J.P., 2005
Congo	30	*2008*	15	*2008*	39.5	*2008*	IEA, 2009[2]
Congo (DR)	11.1	*2008*	25	*2008*	4	*2008*	IEA, 2009[2]
Cook Islands	99	2006					Cook Islands Statistic Office, 2008
Costa Rica	99.1	*2008*	98	*2008*	99.8	*2008*	IEA, 2009[2]
Côte d'Ivoire	47.3	*2008*	18	*2008*	78	*2008*	IEA, 2009[2]
Cuba	97	*2008*	87.8	*2008*	100	*2008*	IEA, 2009[2]
Djibouti	49.7	2004	10.2	2004	56.9	2004	MDGR, 2005; PRSP, 2004; Estimate
Dominica	99	2006	96.3	2006	100	2006	GTZ, 2007; Estimates
Dominican Republic	95.9	*2008*	90.4	*2008*	98.4	*2008*	IEA, 2009[2]
Ecuador	92.2	*2008*	78	*2008*	99.6	*2008*	IEA, 2009[2]
Egypt	99.4	*2008*	99.1	*2008*	100	*2008*	IEA, 2009[2]
El Salvador	86.4	*2008*	70	*2008*	97.1	*2008*	IEA, 2009[2]
Equatorial Guinea	27	2006	6.2	2004	71.2	2004	IEA, WEO 2008 ; Thiam N., Thomas J.P., (not dated); Estimates
Eritrea	32	*2008*	5	*2008*	86	*2008*	National Statistics and Evaluation Office and ORC Macro, 2003
Ethiopia	15.3	*2008*	2	*2008*	80	*2008*	Central Statistical Agency and ORC Macro, 2006
Fiji	60	2004					ADB (not dated);
Gabon	36.7	*2008*	18	*2008*	40	*2008*	IEA, 2009[2]
Gambia	8.3	2002	2.8	2002	45.9	2002	UNICEF, 2003
Ghana	54	*2008*	23	*2008*	85	*2008*	IEA, 2009[2]
Grenada	99.5	2006	99.1	2006	100	2006	GTZ, 2007; Estimates
Guatemala	80.5	*2008*	68	*2008*	93.7	*2008*	IEA, 2009[2]
Guinea	20.2	2005	2.8	2005	63.8	2005	Direction Nationale de la Statistique et ORC Macro, 2006
Guinea-Bissau	11.5	2005	<1	2005	30.7	2005	ENDA, 2005
Guyana	77.5	2005	75.7	2005	81.6	2005	Ministry of Health Georgetown, Guyana, 2006

Country	% of population with electricity access						Source(s)
	National	Year	Rural	Year	Urban	Year	
Haiti	38.5	*2008*	11.7	*2008*	68.9	*2008*	IEA, 2009[2]
Honduras	70.3	*2008*	45	*2008*	97.9	*2008*	IEA, 2009[2]
Hong Kong, China	100	*2005*	100	*2005*	100	*2005*	UNESCAP, http://www.unescap.org/esd/energy/information/ElectricPower/1999-2000/html/Table%206-Access%20to%20electricity.xls
India	64.5	*2008*	52.5	*2008*	93.1	*2008*	IEA, 2009[2]
Indonesia	64.5	*2008*	32	*2008*	94	*2008*	IEA, 2009[2]
Iran	98.4	*2008*	95	*2008*	100	*2008*	IEA, 2009[2]
Iraq	85	*2008*	57	*2008*	99	*2008*	IEA, 2009[2]
Jamaica	92	*2008*	83.4	*2008*	99.5	*2008*	IEA, 2009[2]
Jordan	99.9	*2008*	100	*2008*	99.5	*2008*	IEA, 2009[2]
Kenya	15	*2008*	5	*2008*	51.3	*2008*	IEA, 2009[2]
Kiribati	60	2005					UNDP, 2005
Korea (DPR)	26	*2008*	10	*2008*	36	*2008*	IEA, 2009[2]
Korea (Rep)	100	2007	100	2007	100	2007	UNDP, 2007
Kuwait	100	*2008*	100	*2008*	100	*2008*	IEA, 2009[2]
Lao PDR	55	*2008*	42	*2008*	84	*2008*	IEA, 2009[2]
Lebanon	99.9	*2008*	99.3	*2008*	100	*2008*	IEA, 2009[2]
Lesotho	16	*2008*	6	*2008*	44	*2008*	IEA, 2009[2]
Liberia[1]	3.3	2007	1	2007	7	2007	Liberia Institute of Statistics and Geo-Information Services, Ministry of Health and Social Welfare, National AIDS Control Program, and Macro International Inc, 2008
Libya	99.8	*2008*	99	*2008*	100	*2008*	IEA, 2009[2]
Madagascar	19	*2008*	5	*2008*	53	*2008*	IEA, 2009[2]
Malawi	9	*2008*	5.3	*2008*	25	*2008*	IEA, 2009[2]
Malaysia	99.4	*2008*	98	*2008*	100	*2008*	IEA, 2009[2]
Maldives	100	2006	100	2006	100	2006	Ministry of Planning and National Development
Mali[1]	17.4	2006	3.7	2006	48.7	2006	Cellule de Planification et de Statistique du Ministère de la Santé et al., 2007
Marshall Islands[3]	74.5	2007	32.3	2007	92.1	2007	EPPSO, SPC and Macro International Inc., 2008

Country	% of population with electricity access						Source(s)
	National	Year	Rural	Year	Urban	Year	
Mauritania	30.1	2005	2	2005	47	2005	Interview de Zeïdane Ould H'Meyda, le ministre du Pétrole et de l'Énergie, at http://www.jeuneafrique.com; Estimate
Mauritius	99.4	*2008*	99	*2008*	100	*2008*	IEA, 2009[2]
Mexico	98.5	2006	96.1	2006	99.7	2006	ECLAC, 2008
Micronesia	54	2000					PIREP, 2004
Mongolia	67	*2008*	36	*2008*	90	*2008*	IEA, 2009[2]
Morocco	97	*2008*	96	*2008*	98	*2008*	IEA, 2009[2]
Mozambique	11.7	*2008*	6.3	*2008*	21	*2008*	IEA, 2009[2]
Myanmar	13	*2008*	10	*2008*	19	*2008*	IEA, 2009[2]
Namibia	34	*2008*	13	*2008*	70	*2008*	IEA, 2009[2]
Nauru[3]	99.9	2007			99.9	2007	Nauru Bureau of Statistics, SPC and Macro International Inc. 2007
Nepal	43.6	*2008*	34	*2008*	89.7	*2008*	IEA, 2009[2]
Nicaragua	72.1	*2008*	42	*2008*	95	*2008*	IEA, 2009[2]
Niger	9.3	2006	1.5	2006	47.2	2006	Institut National de la Statistique et Macro International Inc, 2007
Nigeria	46.8	*2008*	26	*2008*	69	*2008*	IEA, 2009[2]
Niue	99	2006					Secretariat of the Pacific Community, National Planning and Development Office, Niue, 2008
Occupied Palestinian Territories	99.7	2006	99.4	2006	99.8	2006	Palestinian Central Bureau of Statistics, www.pcbs.gov.ps
Oman	98	*2008*	93	*2008*	99.9	*2008*	IEA, 2009[2]
Pakistan	57.6	*2008*	46	*2008*	78	*2008*	IEA, 2009[2]
Palau	99.5	2006	*98.4*	2006	*100*	2006	Palau Office of Planning and Statistics, UNDP, 2008; Estimates
Panama	88.1	*2008*	72	*2008*	94	*2008*	IEA, 2009[2]
Papua New Guinea	10	2004	5	2004	42.8	2004	PIREP, 2004
Paraguay	94.5	*2008*	88	*2008*	98.8	*2008*	IEA, 2009[2]
Peru	76.9	*2008*	28	*2008*	96.4	*2008*	IEA, 2009[2]
Philippines	86	*2008*	65	*2008*	97	*2008*	IEA, 2009[2]
Qatar	98.7	*2008*	70	*2008*	100	*2008*	IEA, 2009[2]
Rwanda	4.8	2005	1.3	2005	25.1	2005	Institut National de la Statistique du Rwanda and ORC Macro, 2006

Country	% of population with electricity access						Source(s)
	National	Year	Rural	Year	Urban	Year	
Saint Kitts and Nevis	87	2003					ESMAP, 2005
Saint Lucia	99	2006	*98.5*	2006	*100*	2006	GTZ, 2007; Estimates
St Vincent & Grenadines	99	2006	*97.5*	2006	*100*	2006	GTZ, 2007; Estimates
Samoa	97	2006					Samoa Bureau of Statistics, 2008
Sao Tome and Principe	48.5	2005	33.7	2005	61.6	2005	Instituto Nacional de Estatistica Sao Tome, 2005, QUIBB 2005 – Dados Preliminares (http://www.ine.st/quadro_resumo_quibb.htm)
Saudi Arabia	99	*2008*	95	*2008*	100	*2008*	IEA, 2009[2]
Senegal	42	*2008*	18	*2008*	74.7	*2008*	IEA, 2009[2]
Seychelles	96	2002					Seychelles National Statistics Bureau, 2007
Sierra Leone	5.1	2007	0.1	2007	12.7	2007	Government of Sierra Leone, 2007
Singapore	100	*2008*	100	*2008*	100	*2008*	IEA, 2009[2]
Solomon Islands[3]	14.4	2007	5.1	2007	70.6	2007	SISO, SPC and Macro International Inc., 2007
South Africa	75	*2008*	55	*2008*	88	*2008*	IEA, 2009[2]
Sri Lanka	76.6	*2008*	75	*2008*	85.8	*2008*	IEA, 2009[2]
Sudan	31.4	*2008*	19	*2008*	47.5	*2008*	IEA, 2009[2]
Suriname	78.6	2007					Bureau voor de Statistiek in Suriname, 2007
Swaziland[1]	29.7	2007	20.2	2007	65.2	2007	Central Statistical Office and Macro International Inc, 2008
Syrian Arab Republic	92.7	*2008*	84	*2008*	100	*2008*	IEA, 2009[2]
Tanzania	11.5	*2008*	2	*2008*	39	*2008*	IEA, 2009[2]
Thailand	99.3	*2008*	99	*2008*	100	*2008*	IEA, 2009[2]
Timor-Leste	22	*2008*	10.5	*2008*	52	*2008*	IEA, 2009[2]
Togo	20	*2008*	4	*2008*	42	*2008*	IEA, 2009[2]
Tonga	92.3	2006	90.7	2006	97.7	2006	Tonga Statistics Department, 2008
Trinidad and Tobago	99	*2008*	99	*2008*	99.9	*2008*	IEA, 2009[2]
Tunisia	99.5	*2008*	98.5	*2008*	100	*2008*	IEA, 2009[2]
Turkey	100	2007	*100*	2007	*100*	2007	UNESCAP, http://www.unescap.org/esd/energy/information/ElectricPower/1999-2000/ Estimates

Country	% of population with electricity access						Source(s)
	National	Year	Rural	Year	Urban	Year	
Tuvalu	98	2005	95	2005	100	2005	Tuvalu Government Ministry of Finance, Economic Planning & Industries, 2006; Estimates
Uganda	9	*2008*	4	*2008*	42.5	*2008*	IEA, 2009[2]
United Arab Emirates	100	*2008*	100	*2008*	100	*2008*	IEA, 2009[2]
Uruguay	99.5	*2008*	82.4	*2008*	99.4	*2008*	IEA, 2009[2]
Vanuatu	19	2000	7	*2000*	61	*2000*	PIREP, 2004
Venezuela	99	*2008*	85	*2008*	100	*2008*	IEA, 2009[2]
Viet Nam	89	*2008*	85	*2008*	99.6	*2008*	IEA, 2009[2]
Yemen	38.2	*2008*	22	*2008*	75	*2008*	IEA, 2009[2]
Zambia	18.8	*2008*	3.3	*2008*	47	*2008*	IEA, 2009[2]
Zimbabwe	41.5	*2008*	19	*2008*	79	*2008*	IEA, 2009[2]

Note: Figures in italic are estimated. See Section II for details. Dates in italics are presumed based on available information.

1. Data refers to percentage of people with access. 2. *World Energy Outlook 2009* (OECD/IEA 2009). Year of electrification rates reports to the year 2008 or latest year available.

Table 19. Fuels used for cooking and access to modern fuels, by country (national population)

Country	% of the national population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Afghanistan	*2*	10	*0*	*0.5*	*57.5*	*27*		*3*	12	2005	Ministry of Rural Rehabilitation and Development and the Central Statistics Office, Kabul, 2007
Algeria	0.5	98.2		0.3	0.9			0.1	98.7	2006	Office National des Statistiques, UNICEF, 2007
Angola[3]	0.2	51.9		18.7	28.6	0.4		*0.2*	52.1	2006-07	COSEP, Consultoria, Lda., Consaúde, Lda., 2007
Antigua and Barbuda	0.7	96.2	0.1		0.5		1.5	1	97	2007	Kairi Consultants, National Assessment Team of Antigua and Barbuda, 2007
Argentina		94.8		4.9				0.3	94.8	2001	2001 census at www.indec.gov.ar
Bahamas[5]									>95	2007	Estimation
Bahrain[5]									>95	2007	Estimation
Bangladesh[3]		8.8		0	82.6	8.3		0.3	8.8	2007	NIPORT et al., 2009

Country	% of the national population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Barbados[5]									>95	2007	Estimation
Belize	1.1	81.7	1	0.1	13.6			2.5	83.8	2006	MICS and MDG Indicators, Belize, 2006
Benin	0	3.7	1.9	21.2	72.2			1	5.6	2006	INSAE, République du Bénin, 2007
Bhutan	34.2	22.6	0.1		40.7			2.4	56.9	2007	National Statistics Bureau, Royal Government of Bhutan, 2007
Bolivia	0.7	68	0		28.4	0		2.6	68.7	2007	Instituto Nacional de Estadistica, 2009
Botswana	7.2	45.8	3.3		43.4	0.1	0.1	0.2	56.2	2006	Central Statistics Office, 2009
Brazil	0.5	86.7	0	0.4	10.2		1.8	0.3	87.2	2003	WHO, 2003
Burkina Faso	0.1	6.3	0.4	4.3	88.5	0		0.4	6.8	2007	Ministère de l'Economie et des Finances, Institut National de la Statistique et de la Démographie, 2007
Burundi	0.1	0.2	0	5.1	94.2		0.2	0.2	0.3	2005	ISTEEBU and UNICEF, 2008
Cambodia	0.2	7.3	0	7.9	84.4	0.1	0	0.1	7.5	2005	National Institute of Public Health, National Institute of Statistics and ORC Macro, 2006
Cameroon	0.1	16.1	5.2	1.7	73.5			3.4	21.4	2006	Ministère de l'Economie, De la Planification et de L'Aménagement du Territoire, Institut National de la statistique, UNICEF, 2007
Cape Verde		62.5			35.1			2.4	62.5	2006	Republic of Cape Verde, Ministry of Finance and Public Administration, 2008
Central African Republic	0.3	0.1	0.2	2.2	96.9	0	0	0.3	0.6	2006	Institut Centrafricain des Statistiques, et des Etudes Economiques et Sociales, 2007
Chad	0.7	1.5	0.3	15.4	70.8	0.1	4.9	6.3	2.5	2003	WHO, 2003
Chile[5]									> 95	2007	Estimation
China	*10.6*	*31.1*	*0.3*	*0*	*26.7*		*28.9*	*2.5*	*42*	2007	Author's calculation based on rural and urban data
Colombia	7.2	74.5	0.8		14.8		0.4	2.3	82.5	2005	Asociación Probienestar de la Familia Colombiana Profamilia, 2005
Comoros	0.1	2.3	22.1	0.7	74.6			0.2	24.5	2004	Lachaud J.P., 2005

Country	% of the national population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Congo	2.8	8.7	5.5	30.7	50.6	0.7		1.0	17	2005	CNSEE et ORC Macro, 2006
Congo DR[3]	4.6		0.1	28.9	66.2			0.2	4.7	2007	Ministère du Plan et Macro International, 2008
Cook Islands	6	87.2	1		4.8			1	94.2	2006	Cook Islands Statistic Office, 2008
Costa Rica	52.7	33.6		12.6				*1.1*	86.3	2000	Organizacion Panamericana de la Salud, Red Interamericana de Centros de Salud en la Vivienda, 2001
Côte d'Ivoire	0.1	13.7		19.6	66.3			0.3	13.8	2006	Institut National de la Statistique, 2007
Cyprus[5]									> 95	2007	Estimation
Djibouti	0.6	4.9	80.6	8.7	3.7			1.5	86.1	2006	Ministère de la Santé, République de Djibouti, 2007
Dominican Republic[3]	0.1	88.2		2.8	6.8	0		2.1	88.3	2007	CESDEM y Macro International Inc., 2008
Ecuador	0.3	91		8.6				0.1	91.3	2006	Instituto Nacional de Estatistica y Censos, 2006
Egypt	0.2	96	3.4	0	0.2	0.1	0	0.1	99.6	2005	El-Zanaty F. and Way A., 2006
El Salvador	1.0	72.6	0.1		21.8		0.1	4.4	73.7	2007	DIGESTYC, 2008
Eritrea	0.6	4.7	28	1.7	59.4	5.2		*0.4*	33.3	2002	NSEO and ORC Macro, 2003
Ethiopia	0.2	0.1	3.9	2.8	85	7.4		0.6	4.2	2005	Central Statistical Agency and ORC Macro, 2006
Fiji	3	28	21		48				52	1996	UNDP, 2005
Gabon		68.3			26.8			4.9	68.3	2006	World Bank, 2006
Gambia	0.1	4.6	0.2	12.8	78		0.1	*4.2*	4.9	2005-06	GBoS, 2007
Ghana[3]	0.1	10.4	0.6	34.8	50.8			*3.3*	11.1	2006	GSS, GHS, and ICF Macro, 2009
Guatemala	0.6	36.9	0	0.4	61.3		0	*0.8*	37.5	2003	WHO, 2003
Guinea	0.3	0.1	0.1	78.6	0.3		19.2	*1.4*	0.5	2005	DNS et ORC Macro, 2006
Guinea-Bissau	1.2			29.3	69			0.5	1.2	2006	Ministère de l`Economie - Secrétariat d`Etat du Plan et à l`Intégration Régionale, 2006
Guyana	1.6	48	39.2	0.4	10.2			0.5	88.9	2006	Bureau of Statistics and UNICEF, 2008

Country	% of the national population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
\Haiti	0	3.1	2.9	41.6	51.8		0.3	0.3	6	2005-06	Cayemittes, M. et al., 2007
Honduras	19.5	19.9	5.8		52.2		0.1	2.5	45.2	2005-06	Secretaría de Salud, INE y Macro International, 2006
Hong Kong, China[5]									>95	2007	Estimation
India	0.4	25.2	3.2	0.4	57.9	10.6	1.9	0.4	28.8	2005-06	IIPS and Macro International, 2007
Indonesia	0.2	11.2	34.2	0.4	53.4	0	0	*0.6*	45.6	2007	Statistics Indonesia (Badan Pusat Statistik—BPS) and Macro International, 2008
Iraq	0.2	86.3	8.9		3.8	0.7	0.1	0.0	95.4	2006	Central Organization for Statistics & Information Technology, Kurdistan R egional Statistics Office, 2007
Jamaica	1.6	79.8	0.4	15.6				2.5	81.8	2001	Personal communication, Census 2001
Jordan	0.2	99.5	0.1	0.1				0.1	99.8	2007	Department of Statistics and Macro International Inc, 2008
Kenya	0.6	3.5	13.2	13.3	68.7			*0.7*	17.3	2005-06	Kenya National Bureau of Statistics, 2009
Korea (Rep.)	0.1	99.7	0.1					0.1	99.9	1998	UNESCAP, at http://www.unescap.org/esd/energy/ publications/psec/tables/guidelines-table-112.jpg
Kuwait[5]									>95	2007	Estimation
Lao PDR	1.5	1.1	0	1.5	74.8	0	21.2		2.6	2006	Department of Statistics and UNICEF, 2008
Lebanon[4]	1.2	99.6	0.1	1.3		0	0	0	≥99.6	2004	Lebanese Republic Ministry of Social Affairs, UNDP, 2006
Lesotho	1.8	22	13.5	0.1	56.6	5.7	0	0.3	37.3	2004	MOHSW, BOS and ORC Macro, 2005
Liberia[3]	0	0	0	40.5*	58.9		*	0.6	0	2007	LISGIS, et al., 2008
Libya[5]									>95	2007	Estimation
Madagascar	0.2	0.3	0.1	17.4	81.7			*0.3*	0.6	2005	INSTAT, Ministère de l'Economie, des Finances et du Budget, 2006
Malawi	1.2	0	0	7.2	91.4	0	0	*0.2*	1.2	2006	National Statistical Office and UNICEF, 2008
Malaysia	0.5	95.8	0.3	0.1	0.8		2.5	2.5	96.7	2003	WHO, 2003

Country	% of the national population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Maldives		76.8	4.39		13.62			5.2	81.19	2006	Ministry of Planning and National Development, 2006
Mali[3]	0	0.2		14.5	82.6	2		*0.7*	0.2	2006	CPS/MS, DNSI/MEIC et Macro International Inc., 2007
Marshall Islands[3]	17.3	18.6	29.9	0.1	33.5			0.6	65.8	2007	EPPSO, SPC and Macro International Inc., 2008
Mauritania	1.3	36		23.2	38.9			*0.6*	37.3	2007	Office National de la Statistique and UNICEF, 2008
Mauritius	2.2	91	2.6		4.1			*0.1*	95.8	2004	Central Statistics Office, Ministry of Finance and Economic Development, 2004
Mexico	0.5	85	0	0.5	13.2	0	0.3	*0.5*	85.6	2003	WHO, 2003
Micronesia	*10.6*	*3.6*	*44.1*		41.5			*0.2*	58.3	2005	Government of the Federated States of Micronesia, 2008
Mongolia	22.9	0.3		0.2	34	23.3	19.4	*0.0*	23.2	2005	National Statistical Office, UNICEF, 2007
Morocco	0.1	91.1	0	0.4	7.8		0.2	0.4	91.2	2003-04	Measure DHS, Personal communication
Mozambique	0.8	1.4	0.5	0.4	84	0.2	12.6	*0.1*	2.7	2003	Instituto Nacional de Estatística, Ministério da Saúde, ORC Macro, 2005
Myanmar	3	0.3	0.1	22.4	70.2		0	*4*	3.4	2003	WHO, 2003
Namibia[3]	29.3	5.7	0.1	0.6	62.3	0.3	0	*1.7*	35.1	2006-07	MoHSS, Macro International Inc., 2008
Nauru[3]	81.8	4.1	5.2		8.3			0.6	91.1	2007	Nauru Bureau of Statistics, SPC and Macro International Inc., 2007
Nepal	0.1	12.6	3.5	0.1	75.2	8	0	0.5	16.2	2006	MOHP, New ERA, and Macro International Inc., 2007
Nicaragua	0.6	41	0.1		56.5		0.6	*1.2*	41.7	2006-07	INIDE, MINSA, 2008
Niger	0.2	0.7		2.8	94.2	2		*0.1*	0.9	2006	INS et Macro International Inc., 2007
Nigeria	0.3	1	23	2.2	72.3	0.5	0.1	*0.6*	24.3	2007	National Bureau of Statistics, UNICEF, 2007
Niue	56	31	1	5	7	0	0	0.0	88	2006	Secretariat of the Pacific Community, National Planning and Development Office, Niue, 2008
Occupied Palestinian Territories	0.5	*99*			0.5			0.0	99.5	2006	Palestinian Central Bureau of Statistics, 2007; Estimations

Country	% of the national population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Oman[5]									>95	2007	Estimation
Pakistan[3]	0.2	32.1		0.4	60.2	6.9		*0.2*	32.3	2006-07	NIPS, and Macro International Inc., 2008
Palau	25	53.9	19.7		1			*0.4*	98.6	2005-06	Palau Office of Planning and Statistics, UNDP, 2008
Panama	0.6	80.2	0.2		17.3		0	*1.7*	81	2000	Direccion de Estadistica Y Censo
Papua New Guinea	3	3	7		87			0.0	13	1997	UNDP, 2005
Paraguay	1	49.9	0	0	33.8		13.8	1.5	50.9	2007	Direccion General de Estadistica, 2007
Peru	2	56	3		30	4	3	2	61	2007	Instituto nacional de estadistica e informatica, 2007
Philippines	1.3	43.4	4.7	6.8	41.8			2.0	49.4	2004	National Statistics Office, 2004
Qatar				*0*	*0*	*0*	*0*		100	2005	MDGR, 2005
Rwanda	0.1	0	0.1	6.5	92.1	0.2	0.3	*0.7*	0.2	2005	INSR and ORC Macro, 2006
Saint Kitts and Nevis[5]									>95	2007	Estimation
Saint Lucia	0.4	85	0.2	7	5.1			2.3	85.6	2001	The St Lucia Government Statistics Department, 2001
Samoa	*4.3*	*9.6*	*4.6*		*81.4*			0	18.57	2006	Samoa Bureau of Statistics, 2008
Saudi Arabia[5]									>95	2007	Estimation
Senegal	0	41.1		7.8	47.7	0.6		2.8	41.1	2006	MIS, 2006, Personal communication
Seychelles[5]									>95	2007	Estimation
Sierra Leone	0	0.1	0.7	13.8	85.2			0.2	*0.8*	2007	Government of Sierra Leone, 2007
Singapore[5]									>95	2007	Estimation
Solomon Islands[3]	0.3	7.1		88.1	1.8		2.4	*0.3*	7.4	2006-07	SISO, SPC and Macro International Inc., 2007
Somalia	0.1	0	0.2	33.1	66.5			*0.1*	0.3	2006	UNICEF, 2006
South Africa	66.4	2	14.8		15.2	0.2	1.2	*0.2*	83.2	2007	Lehohla P., 2007
Sri Lanka		17.1	2.4		79.5			1.0	19.5	2006-07	Department of Census and Statistics, Ministry of Finance and Planning Sri Lanka, 2008

Country	% of the national population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Sudan	0.1	6.4	0.4	1.3	56.2	0.5	14.3	20.8	6.9	2006	Central Bureau of Statistics, Republic of Sudan, 2007
Swaziland[3]	12.6	11.2		0.4	71.7		0.2	3.9	23.8	2006-07	CSO, and Macro International Inc., 2008
Syrian Arab Republic	1.4	98.1						*0.5*	99.5	2006	Central Bureau of Statistics, UNICEF, 2007
Tanzania	0.3	0.2	2.3	19	77.6	0		0.5	2.8	2007-08	TACAIDS, ZAC, NBS, OCGS, and Macro International Inc., 2008
Thailand	3.4	59.7		18.8	18.1		0	*0*	63.1	2005-06	Thailand National Statistical Office, 2006
Togo	0.1	1.2	0.5	43.8	54			*0.4*	1.8	2006	Direction Generale de la Statistique et de la Comptabilité Nationale, 2007
Tokelau		34.2	55.8		0.9			*9.1*	90	2006	Statistics New Zealand and the Office of the Council for the Ongoing Government of Tokelau, 2006
Tonga	3.5	53.6	2		40.9			*0*	59.1	2006	Tonga Statistics Department, 2008
Trinidad and Tobago	5.7	93.2	0.1		0.3			*0.7*	99	2006	Ministry of Social Development, Central Statistical Office, UNICEF, 2008
Tunisia		98.4		0.4				*1.2*	98.4	2006	Ministère de la Santé Publique, Office National de la Famille et de la Population, UNICEF, 2008
Tuvalu	0.9	12.1	58.3		28			*0.7*	71.3	2004-05	Tuvalu Government Ministry of Finance, Economic Planning & Industries, 2006
Uganda[3]	0	0.1	0.3	13	85.8			0.8	0.4	2006	UBOS and Macro International Inc., 2007
United Arab Emirates	4.8	94.4						0.8	99.2	2003	WHO, 2003
Uruguay	6.8	87.7	1.1		4.3			*0.1*	95.6	2006	Instituto Nacional de Estadistica Uruguay, Encuesta Nacional de Hogares Ampliada, 2006
Vanuatu	0.9	12.2	1.4	0.5	84.5	0		0.5	14.5	2007	Ministry of Health, Government of Vanuatu, 2008

Country	% of the national population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Viet Nam	0.4	32.3	1.3	3.5	56.8		5.2	0.5	34	2006	General Statistics Office of Viet Nam, 2007
Yemen	0.6	58.9	3.4	36.2				*0.9*	62.9	2006	Ministry of Health and Population, UNICEF 2008
Zambia[3]	15.8	0	0	24.5	59.5	0.1	0.2	0	15.8	2007	CSO, MOH, TDRC, University of Zambia, and Macro International Inc., 2009
Zimbabwe	32.6	0	0.2	0.1	66.8	0.1	0.1	0.1	32.8	2005-06	CSO and Macro International Inc., 2007

Note: Figures in italic are estimated. See Section II for details. 1. Wood includes wood, wood chips, straw and crop residues. Gas includes natural gas, LPG, biogas and ethanol. Kerosene also includes paraffin. Coal includes coal dust and lignite. Other includes missing data, 'no cooking in the house' as well as other fuels. 2. Access to modern fuels includes percent of population using electricity, gas or kerosene as primary cooking fuels. 3. Data refers to percentage of people with access. 4. More than one cooking fuels is indicated, therefore the total is higher than 100 percent. 5. Countries with a Gross National Income (GNI) per capita above US$ 10,500 and for which no survey data is available are assumed to have made a complete transition to using non-solid fuels as the primary source of domestic energy for cooking and heating.

Table 20. Fuels used for cooking and access to modern fuels, by country (rural population)

Country	% of the rural population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Afghanistan	0	3	0	*0.5*	*65*	*30*		*1.5*	3	2005	Ministry of Rural Rehabilitation and Development and the Central Statistics Office, Kabul, 2007
Algeria	0.3	96.8		0.7	2.1			0.1	97.1	2006	Office National des Statistiques, UNICEF, 2007
Angola[3]	0.2	10.4		25.7	62.5	1		*0.2*	10.6	2006-07	COSEP, Consultoria, Lda., Consaúde, Lda., 2007
Argentina		67.1		32.4				0.5	67.1	2001	2001 census at www.indec.gov.ar
Bangladesh[3]	0	0.6			89.6	9.7	0	*0.1*	0.6	2007	NIPORT, Mitra and Associates, and Macro International, 2009
Belize	0.8	69.1	1.1	0.1	27	*0*	*0*	1.9	71	2006	MICS and MDG Indicators, Belize, 2006
Benin	0	0.2	0.9	6.5	91.7			*0.7*	1.1	2006	INSAE, République du Bénin, 2007
Bhutan	27.4	13	0.2		57.2			*2.2*	40.6	2007	National Statistics Bureau, Royal Government of Bhutan, 2007

Country	% of the rural population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Bolivia	0	29.1	0.1		69	1.1		0.7	29.2	2007	Instituto Nacional de Estadistica, 2009
Botswana	2.5	21.3	1.3		74.4	0.3	0.1	0.1	25.1	2006	Central Statistics Office, 2009
Brazil	0.3	46.7	0	1.6	45.8	0	5.4	0.2	47	2003	WHO, 2003
Burkina Faso	0	1.4	0.4	1.7	96.4	0	0	*0.1*	1.8	2007	Ministère de l'Economie et des Finances, Institut National de la Statistique et de la Démographie, 2007
Burundi	0	0.2	0	2	97.5		0	0.3	0.2	2005	ISTEEBU and UNICEF, 2008
Cambodia	0.1	3.4	0	4.9	91.3	0.2	0	0.1	3.5	2005	National Institute of Public Health, National Institute of Statistics and ORC Macro, 2006
Cameroon	0	1.4	1.2	1	93.9			2.5	2.6	2006	Ministère de l'Economie, De la Planification et de L'Aménagement du Territoire, Institut National de la statistique, UNICEF, 2007
Cape Verde		27.6			70.7			*1.7*	27.6	2006	Republic of Cape Verde, Ministry of Finance and Public Administration, 2008
Central African Republic	0	0	0.3	1.2	98.2	0	0	*0.3*	0.3	2006	Institut Centrafricain des Statistiques, et des Etudes Economiques et Sociales, 2007
Chad	0.6	0.9	0.2	8.4	82.9	0.1	1.1	5.8	1.7	2003	WHO, 2003
China	*7.5*	*17.8*	*0.1*	*0*	*43.1*		*29.8*	*1.7*	*25.5*	*2007*	National agriculture census, 2008 Carolina Population Center, National Institute of Nutrition and Food Safety, 2008
Colombia	4.1	40.7	0.4		52		1	1.8	45.2	2005	Asociación Probienestar de la Familia Colombiana Profamilia, 2005
Comoros	0	0.4	9.4	0.4	85.4		0.2	4.2	9.8	2003	WHO, 2003
Congo	0.4	1	1.7	9.7	86	0.1		*1.1*	3.1	2005	CNSEE et ORC Macro, 2006
Congo DR[3]	0		0	11.4	88.5			*0.1*	0	2007	Ministère du Plan et Macro International, 2008

Country	% of the rural population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Costa Rica	38.9	38		21.7				*1.4*	76.9	2000	Organizacion Panamericana de la Salud, Red Interamericana de Centros de Salud en la Vivienda, 2001
Côte d'Ivoire	0.1	0.2		4.8	94.7			*0.2*	0.3	2006	Institut National de la Statistique, 2007
Djibouti	0	0.6	18.4	47.1	28.4			*5.5*	19	2006	Ministère de la Santé, République de Djibouti, 2007
Dominican Republic[3]	0.1	72.8		5	19.2			*2.9*	72.9	2007	CESDEM y Macro International Inc., 2008
Ecuador	0.1	76.1		23.6				0.27	76.2	2006	Instituto Nacional de Estatistica y Censos, 2006
Egypt	0.1	93.6	5.5	0	0.4	0.2	0	*0.2*	99.2	2005	El-Zanaty, Fatma and Ann Way, 2006
El Salvador	0.1	46.0	0.1		49.0		0.0	*4.7*	46.3	2007	DIGESTYC, 2008
Eritrea	0	0.2	8.9	0.9	82.1	7.7		*0.2*	9.1	2002	NSEO and ORC Macro, 2003
Ethiopia	0	0	0.2	0.2	91.1	8.3		0.2	0.2	2005	Central Statistical Agency and ORC Macro, 2006
Gabon		22.6			76.6			0.8	22.6	2006	World Bank, 2006
Gambia	0	1.6	0	4.4	92.6		0	1.4	1.6	2005-06	GBoS, 2007
Ghana[3]	0.1	2.1	0.1	15	81.8			*0.9*	2.3	2008	GSS, GHS, and ICF Macro, 2009
Guatemala	0.1	14.3	0	0	84.2		0.5	0.8	14.4	2003	WHO, 2003
Guinea	0	0	0	96.4	0.1		3.1	0.4	0	2005	DNS et ORC Macro, 2006
Guinea-Bissau	0.1			2.8	96.8			0.3	0.1	2006	Ministère de l`Economie - Secrétariat d`Etat du Plan et à l`Intégration Régionale, 2006
Guyana	0.7	42.3	42.1	0.5	13.9			*0.5*	85.1	2006	Bureau of Statistics and UNICEF, 2008
Haiti	0	0.9	0.9	19.5	78.3		0.3	*0.1*	1.8	2005-06	Cayemittes, M. et al., 2007,
Honduras	4.8	6.7	1		85.5		0.2	*1.8*	12.5	2005-06	Secretaría de Salud, INE y Macro International, 2006

Country	% of the rural population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
India	0.1	8.6	0.8	0.3	74.7	14.4	0.8	0.3	9.5	2005-06	IIPS and Macro International, 2007
Indonesia	0.1	3.9	18.5	0.5	76.6		0	*0.4*	22.5	2007	Statistics Indonesia (Badan Pusat Statistik—BPS) and Macro International, 2008
Iraq	0.2	74.1	12.8		10.5	2.1	0.3	*0.0*	87.1	2006	Central Organization for Statistics & Information Technology, Kurdistan Regional Statistics Office, 2007
Jordan	0.1	99	0.3	0.5				0.1	99.4	2007	Department of Statistics and Macro International Inc., 2008
Kenya	0.2	0.7	2.7	7.7	88.2			0.5	3.6	2005-06	Kenya National Bureau of Statistics, 2009
Korea (Rep.)		99	0.5					*0.5*	99.5	1998	UNESCAP, at http://www.unescap.org/esd/energy/publications/psec/tables/guidelines-table-112.jpg
Lao PDR	*0.1*	*0.1*		*1*	*88*		*10.8*	*0*	0.2	2006	Department of Statistics and UNICEF, 2008
Lesotho	0.2	10.7	9.2	0.2	72.1	7.4	0	*0.2*	20.1	2004	MOHSW, BOS and ORC Macro, 2005
Liberia[3]	0	0	0	13.6*	86		*	0.4	0	2007	LISGIS, et al., 2008
Madagascar	0.1	0.1	0.1	6.3	93			*0.4*	0.3	2005	INSTAT, Ministère de l'Economie, des Finances et du Budget, 2006
Malawi	0.2	0	0	1.3	98.3	0	0	*0.2*	0.2	2006	National Statistical Office and UNICEF, 2008
Malaysia	0	94.8	0.5	0.2	1.9			*2.6*	95.3	2003	WHO, 2003
Mali[3]	0	0		4.5	92.5	2.4		*0.6*	0	2006	CPS/MS, DNSI/MEIC et Macro International Inc., 2007
Marshall Islands[3]	0.7	0.5	3.2	0.3	94.9			*0.4*	4.4	2007	EPPSO, SPC and Macro International Inc., 2008
Mauritania	0.5	16.8		17.7	64.3			*0.7*	17.3	2007	Office National de la Statistique and UNICEF, 2008

Country	% of the rural population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Mauritius	0.1	94.5	1.2		2.3			*2*	95.9	2003	WHO, 2003
Mexico	0.3	54.8	0	1.4	41.5	0	0.7	*1.1*	55.1	2003	WHO, 2003
Mongolia	1.8			*	44.9	49.5	3.8*		1.8	2005	National Statistical Office, UNICEF, 2007, Mongolia
Morocco	0	78.1	0	1.2	20.1		0.3	0.3	78.1	2003-04	Measure DHS, Personal communication
Mozambique	0.2	0	0	0.1	98.4	0.2	0.9	0.2	0.2	2003	Instituto Nacional de Estatística, Ministério da Saúde, ORC Macro, 2005
Myanmar	0.1	0	0	11.2	84.6		0	4.1	0.1	2003	WHO, 2003
Namibia[3]	3.9	2.3	0	0.9	92.1	0.5	0.1	*0.2*	6.2	2006-07	MoHSS, Macro International Inc., 2008
Nepal	0	6.3	1	0.1	*83.1*	9.1	0	0.4	7.3	2006	MOHP, New ERA, and Macro International Inc., 2007
Nicaragua	0.3	7.3	0		91.4		0.1	0.9	7.6	2006-07	INIDE, MINSA, 2008
Niger	0.1	0.1		1.2	96.1	2.3		*0.2*	0.2	2006	INS et Macro International Inc., 2007
Nigeria	0.1	0.2	7.3	0.7	90.2	0.7	0	0.8	7.6	2007	National Bureau of Statistics, UNICEF, 2007
Occupied Palestinian Territories		*98.7*	*0.3*		*1*			*0*	99	2006	Palestinian Central Bureau of Statistics, 2007; Estimations
Oman											Estimation
Pakistan[3]	0.2	9.6		0.6	80.3	9.1		0.2	9.8	2006-07	NIPS, and Macro International Inc., 2008
Paraguay	0.9	21.6	0		68.5		7.9	*1.1*	22.5	2007	Direccion General de Estadistica, 2007
Peru	0.1	7.5	2.1		76.7	9	1.3	*3.3*	9.7	2004-05	DHS 2004-2005, personal communication
Philippines	0.2	27	2.4	8.3	60.8		1.4	0	29.5	2003	WHO, 2003
Rwanda	0	0	0	1.3	98	0.2	0	*0.5*	0	2005	INSR and ORC Macro, 2006

Country	% of the rural population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Senegal	0	12.1		7.5	78.5	1.1		0.8	12.1	2006	MIS, 2006, personal communication
Sierra Leone	0	0	0.3	0.5	99	0		*0.2*	0.3	2007	Government of Sierra Leone, 2007
Solomon Islands[3]	0.1	1.9		94.5	0.6	0	2.5	*0.4*	2	2006-07	SISO, SPC and Macro International Inc., 2007
Somalia	0	0	0.1	8	91.8			*0.1*	0.1	2006	UNICEF, 2006
South Africa	36.5	4.8	16	0.4	31.5	0.1	2.7	*8*	57.3	2003	WHO, 2003
Sri Lanka		12.4	1.1		85.6			0.9	13.5	2006-07	Department of Census and Statistics, Ministry of Finance and Planning Sri Lanka, 2008
Swaziland[3]	5.2	6.4		0.3	86.2		0.1	*1.8*	11.6	2006-07	CSO, and Macro International Inc., 2008
Syrian Arab Republic	1.1	98						*0.9*	99.1	2006	Central Bureau of Statistics, UNICEF, 2007
Tanzania	0.1	0	0.3	5.7	93.6	0		0.3	0.4	2007-08	TACAIDS, ZAC, NBS, OCGS, and Macro International Inc., 2008
Thailand	1.9	50.8		23.9	23.3		0.1	*0.0*	52.7	2005-06	Thailand National Statistical Office, 2006
Togo	0	0.2	0.1	17.4	82.3	0		*0.0*	0.3	2006	Direction Generale de la Statistique et de la Comptabilité Nationale, 2007
Tonga	3.2	44.5	2	0	50.2	0		*0.1*	49.7	2006	Tonga Statistics Department, 2008
Tunisia		97		1.2				*1.8*	97	2006	Ministère de la Santé Publique, Office National de la Famille et de la Population, UNICEF, 2008
Uganda[3]	0	0	0.1	5.2	94.3			0.4	0.1	2006	UBOS and Macro International Inc., 2007
United Arab Emirates	1	98.7						0.3	99.7	2003	WHO, 2003
Uruguay	2.8	74.6	1.1		21.2			*0.3*	78.5	2006	Instituto Nacional de Estadistica Uruguay, Encuesta Nacional de Hogares Ampliada, 2006

Country	% of the rural population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Vanuatu	0.5	2.6	1.5	0.2	95			0.2	4.6	2007	Ministry of Health, Government of Vanuatu, 2008
Viet Nam	0.5	19.1	0.8	3.6	70.9		4.5	*0.6*	20.4	2006	General Statistics Office of Viet Nam, 2007
Yemen	0.4	42.9	3.5	52.4				*0.8*	46.8	2006	Ministry of Health and Population, UNICEF, 2008
Zambia[3]	1.8	0		10	88.2	0.1	0	*0*	1.8	2007	CSO, MOH, TDRC, University of Zambia, and Macro International Inc, 2009
Zimbabwe	3.5			0.2	96	0.1	0.2	0	3.5	2005-06	CSO and Macro International Inc., 2007

Note: Figures in italic are estimated. 1. Wood includes wood, wood chips, straw and crop residues. Gas includes natural gas, LPG, biogas and ethanol. Kerosene also includes paraffin. Coal includes coal dust and lignite. Other includes missing data, 'no cooking in the house' as well as other fuels. 2. Access to modern fuels includes percent of population using electricity, gas or kerosene as primary cooking fuels. 3. Data refers to percentage of people with access.

Table 21. Fuels used for cooking and access to modern fuels, by country (urban population)

Country	% of the urban population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Afghanistan	*10.5*	*49.5*	1	*3.5*	*27*	4		*4.5*	61	2005	Ministry of Rural Rehabilitation and Development and the Central Statistics Office, Kabul, 2007
Algeria	0.6	99.4		0	0.1				100	2006	Office National des Statistiques, UNICEF, 2007
Angola[3]	0.1	86		13	0.9	0			86.1	2006-07	COSEP, Consultoria, Lda., Consaúde, Lda., 2007
Argentina		97.8		2				0.3	97.8	2001	2001 census at www.indec.gov.ar
Bahamas									>95	2007	Estimation
Bahrain									>95	2007	Estimation

Country	% of the urban population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Bangladesh[3]	0	37.4			58	3.7		*0.9*	37.4	2007	NIPORT, Mitra and Associates, and Macro International, 2009
Barbados								>95	2007		Estimation
Belize	1.3	92.5	0.9	0	2.1			3.2	94.7	2006	MICS and MDG Indicators, Belize, 2006
Benin	0.1	9	3.2	43	43.3			*1.4*	12.3	2006	INSAE, République du Bénin, 2007
Bhutan	50.1	44.8	0		2.3			*2.8*	94.9	2007	National Statistics Bureau, Royal Government of Bhutan, 2007
Bolivia	1.1	88.8	0		6.5	0.1		3.5	89.8	2007	Instituto Nacional de Estadistica, 2009
Botswana	10.7	63	4.7		21.3	0	0	0.3	78.3	2006	Central Statistics Office, 2009
Brazil	0.5	94.8	0	0.2	3	0	1.1	0.3	95.4	2003	WHO, 2003
Burkina Faso	0.5	24.5	0.4	13.7	59.6	0		*1.3*	25.4	2007	Ministère de l'Economie et des Finances, Institut National de la Statistique et de la Démographie, 2007
Burundi	1.4	1	0	65.4	28.8		2.4	*1*	2.4	2005	ISTEEBU and UNICEF, 2008
Cambodia	0.6	30.2	0.1	25.4	43.6	0	0	*0.1*	30.9	2005	National Institute of Public Health, National Institute of Statistics and ORC Macro, 2006
Cameroon	0.2	30.6	9.1	2.4	53.2			*4.5*	39.9	2006	Ministère de l'Economie, De la Planification et de L'Aménagement du Territoire, Institut National de la statistique, UNICEF, 2007
Cape Verde		86			11.1			*2.9*	86	2006	Republic of Cape Verde, Ministry of Finance and Public Administration, 2008
Central African Republic	0.8	0.2	0.1	4	94.4	0	0.1	*0.4*	1.1	2006	Institut Centrafricain des Statistiques, et des Etudes Economiques et Sociales, 2007
Chad	1.2	3.4	0.5	39.4	29.6	0	17.8	*8.1*	5.1	2003	WHO, 2003

Country	% of the urban population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
China	14.8	49	0.5	0	4.3		27.7	*3.6*	64.3	2006	Carolina Population Center, National Institute of Nutrition and Food Safety, 2008
Colombia	8.3	85.7	1		2.5		0.2	*2.3*	95	2005	Asociación Probienestar de la Familia Colombiana Profamilia, 2005
Comoros	0.3	1.9	51.3	0.2	42.2		0.3	3.8	53.4	2003	WHO, 2003
Congo	4.9	15.6	8.9	49.6	18.7	1.2		*1.1*	29.4	2005	CNSEE et ORC Macro, 2006
Congo DR[3]	10.8		0.2	52.2	36.6			0.2	11	2007	Ministère du Plan et Macro International, 2008
Costa Rica	67.7	28.7		2.6				1	96.4	2000	Organizacion Panamericana de la Salud, Red Interamericana de Centros de Salud en la Vivienda, 2001
Côte d'Ivoire	0.2	31.2		39	29.4			*0.2*	31.4	2006	Institut National de la Statistique, 2007
Djibouti	0.6	5.1	83.6	6.9	2.5			1.3	89.3	2006	Ministère de la Santé, République de Djibouti, 2007
Dominican Republic[3]	0	95		1.9	1.3			1.8	95	2007	CESDEM y Macro International Inc., 2008
Ecuador	0.5	98.8		0.8				0	99.2	2006	Instituto Nacional de Estatistica y Censos, 2006
Egypt	0.2	98.5	1	0	0	0	0	*0.3*	99.7	2005	El-Zanaty F. and Way A., 2006
El Salvador	1.5	86.3	0.1		7.8		0.1	4.3	87.8	2007	DIGESTYC, 2008
Eritrea	1.6	11.9	58.2	3	23.4	1.2		0.7	71.7	2002	NSEO and ORC Macro, 2003
Ethiopia	1	1.2	25.9	18.1	48.7	2.1		3.0	28.1	2005	Central Statistical Agency and ORC Macro, 2006
Gabon		79.6			14.4			*6*	79.6	2006	World Bank, 2006
Gambia	0.1	7.8	0.3	21.7	62.4		0.1	*7.6*	8.2	2005-06	GBoS, 2007
Ghana[3]	1	22.1	0.6	56.6	18.3			1.4	23.7	2008	GSS, GHS, and ICF Macro, 2009
Guatemala	1.2	67.9	0	0.1	30		0.1	0.8	69.1	2003	WHO, 2003
Guinea	1.1	0.3	0.2	33.8	0.8		59.6	*4.2*	1.6	2005	DNS et ORC Macro, 2006

Country	% of the urban population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Guinea-Bissau	3		0	74.2	21.8			1	3	2006	Ministère de l`Economie - Secrétariat d`Etat du Plan et à l`Intégration Régionale, 2006
Guyana	3.6	64.3	29.9	0	1.4		0.2	0.6	97.8	2005	Ministry of Health Georgetown, Guyana, 2006
Haiti	0.1	6.6	6	76.5	10		0.3	0.5	12.7	2005-06	Cayemittes, M. et al., 2007
Honduras	33.6	32.6	10.4		20.1		0.1	3.2	76.6	2005-06	Secretaría de Salud, INE y Macro International, 2006
Hong Kong, China									>95	2007	Estimation
India	0.9	59.2	8.2	0.5	23.3	2.8	4.3	0.8	68.3	2005-06	IIPS and Macro International, 2007
Indonesia	0.4	21	55.2	0.2	22.3		0	*0.9*	76.6	2007	Statistics Indonesia (Badan Pusat Statistik—BPS) and Macro International, 2008
Iran									>95	2007	Estimation
Iraq	0.2	92.2	7		0.5	0	0	*0.1*	99.4	2006	Central Organization for Statistics & Information Technology, Kurdistan Regional Statistics Office, 2007
Jordan	0.2	99.6	0.1	0				0.1	99.9	2007	Department of Statistics and Macro International Inc., 2008
Kenya	1.8	12	44.6	30.2	10.3			1.1	58.4	2005-06	Kenya National Bureau of Statistics, 2009
Korea (Rep.)	*0.1*	*99.9*							100	1998	UNESCAP, at http://www.unescap.org /esd/energy/ publications/ psec/tables/guidelines-table-112.jpg
Kuwait									>95	2007	Estimation
Lao PDR	5	3.5	0	2.2	45.2	0	44	0.1	8.5	2006	Department of Statistics and UNICEF, 2008
Lesotho	7	58.2	27.4	0	6.7	0.5	0	*0.2*	65.2	2004	MOHSW, BOS and ORC Macro, 2005
Liberia[3]	0	0.1	0	85.6	13.6			*0.7*	0.1	2007	LISGIS, et al., 2008
Libya									>95	2007	Estimation
Madagascar	0.9	3	0.2	59.4	35.5	0.1	0.7	*0.2*	4.1	2004	INSTAT et ORC Macro, 2005
Malawi	7.2	0.1	0	41.4	51.2	0	0	0.1	7.3	2006	National Statistical Office and UNICEF, 2008

Country	% of the urban population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Malaysia	0.7	96.4	0.3	0.1	0.1			*2.4*	97.4	2003	WHO, 2003
Mali[3]	0.1	0.7		37.6	59.9	1.1		*0.6*	0.8	2006	CPS/MS, DNSI/MEIC et Macro International Inc., 2007
Marshall Islands[3]	24.3	26.1	41	0	7.9			*0.7*	91.4	2007	EPPSO, SPC and Macro International Inc., 2008
Mauritania	2.2	60		30	7			*0.8*	62.2	2007	Office National de la Statistique and UNICEF, 2008
Mauritius	0.3	94.6	1.1		1.3			*2.6*	96	2003	WHO, 2003
Mexico	0.6	95.5	0	0.1	3.4	0	0.2	*0.3*	96.1	2003	WHO, 2003
Mongolia	39.1			*	25.8	3.9	31.3*		39.1	2005	National Statistical Office, UNICEF, 2007, Mongolia
Morocco	0.1	99.1	0	0	0.4		0	0.4	99.2	2003-04	Measure DHS, Personal communication
Mozambique	2.1	4.9	1.6	1	49.3	0	40.8	0.3	8.6	2003	Instituto Nacional de Estatística, Ministério da Saúde, ORC Macro, 2005
Myanmar	10.3	1	0.3	50.5	34		0.1	*3.8*	11.6	2003	WHO, 2003
Namibia[3]	65.6	10.4	0.2	0.1	19.7	0	0	*4.0*	76.2	2006-07	MoHSS, Macro International Inc., 2008
Nauru[3]	81.8	4.1	5.2		8.3			*0.6*	91.1	2007	Nauru Bureau of Statistics, SPC and Macro International Inc., 2007
Nepal	0.4	43.6	15.8	0.1	36.4	2.5	0	*1.2*	59.8	2006	MOHP, New ERA, and Macro International Inc., 2007
Nicaragua	0.9	65.6	0.2		30.9		0.9	1.5	66.7	2006-07	INIDE, MINSA, 2008
Niger	0.6	3.4		10.4	84.9	0.5		*0.2*	4	2006	INS et Macro International Inc., 2007
Nigeria	0.7	2.4	54.6	5.2	35.9	0	0.2	*1.0*	57.7	2007	National Bureau of Statistics, UNICEF, 2007
Occupied Palestinian Territories	*0.5*	*99*			*0.5*			*0*	99.5	2006	Palestinian Central Bureau of Statistics, 2007; Estimations
Oman									>95	2007	Estimation
Pakistan[3]	0.2	76.1		0.1	20.8	2.4		*0.4*	76.3	2006-07	NIPS, and Macro International Inc., 2008
Paraguay	1.1	68.1	0		11.5		17.5	*1.8*	69.2	2007	Direccion General de Estadistica, 2007
Peru	1.2	74.2	9.8		8.7	0.5	1.9	*3.7*	85.2	2004-05	DHS 2004-2005, personal communication

Country	% of the urban population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Philippines	0.8	61.8	10.7	5.5	19.5		1.5	*0.2*	73.3	2003	WHO, 2003
Qatar									100	2005	MDGR, 2005
Rwanda	0.3	0.2	0.3	37	58.2	0	1.6	*2.4*	0.8	2005	INSR and ORC Macro, 2006
Saint Kitts and Nevis									>95	2007	Estimation
Saudi Arabia									>95	2007	Estimation
Senegal	0	74.4		8.3	12.2	0		*5.1*	74.4	2006	MIS, 2006, Personal communication
Seychelles									>95	2007	Estimation
Sierra Leone	0	0.3	1.4	37.1	61	0		*0.2*	1.7	2007	Government of Sierra Leone, 2007
Singapore									>95	2007	Estimation
Solomon Islands[3]	1	39	0	49.5	8.8	0	1.5	*0.2*	40	2006-07	SISO, SPC and Macro International Inc., 2007
Somalia	0.2	0.1	0.3	79.1	20.1			*0.2*	0.6	2006	UNICEF, 2006
South Africa	76.9	4.2	5.1	0	1.5	0	2.1	*10.2*	86.2	2003	WHO, 2003
Sri Lanka		50.6	10.5		37.6			1.3	61.1	2006-07	Department of Census and Statistics, Ministry of Finance and Planning Sri Lanka, 2008
Swaziland[3]	40	29.3		0.7	17.4		0.7	11.9	69.3	2006-07	CSO, and Macro International Inc., 2008
Syrian Arab Republic	1.7	98.2						0.1	99.9	2006	Central Bureau of Statistics, UNICEF, 2007
Tanzania[3]	0.9	0.8	8.5	59.6	29.2	0		1.1	10.2	2007-08	TACAIDS, ZAC, NBS, OCGS, and Macro International Inc., 2008
Thailand	7.1	81.5		6.2	5.1		0	*0.1*	88.6	2005-06	Thailand National Statistical Office, 2006
Togo	0.3	2.6	1.2	81.8	13.4	0		0.7	4.1	2006	Direction Generale de la Statistique et de la Comptabilité Nationale, 2007
Tokelau											
Tonga	4.5	84.3	1.8	0	9.4	0		0	90.6	2006	Tonga Statistics Department, 2008

Country	% of the urban population									Year	Source(s)
	Fuels used for cooking[1]								Access to modern fuels[2]		
	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal	Other			
Tunisia		99						*1*	99	2006	Ministère de la Santé Publique, Office National de la Famille et de la Population, UNICEF, 2008
Uganda[3]	0.1	0.8	1.7	66	28.3			*3.1*	2.6	2006	UBOS and Macro International Inc, 2007
United Arab Emirates	5.2	94	0					*0.9*	99.2	2003	WHO, 2003
Uruguay	4.9	90.6	1.3		3			0.2	96.8	2006	Instituto Nacional de Estadistica Uruguay, 2006
Vanuatu	2.1	43.8	1.1	1.6	50.6			0.8	47	2007	Ministry of Health, Government of Vanuatu, 2008
Viet Nam	0.2	70.7	2.7	3.3	15.8		7.3	*0*	73.6	2006	General Statistics Office of Viet Nam, 2007
Yemen	1	93.5	3.3	1				*1.2*	97.8	2006	Ministry of Health and Population, UNICEF 2008
Zambia[3]	41.2	0	0	50.7	7.5	0	0.5	*0.1*	41.2	2007	CSO, MOH, TDRC, University of Zambia, and Macro International Inc., 2009
Zimbabwe	87.9	0.6			11.3			*0.2*	88.5	2005-06	CSO and Macro International Inc., 2007

Note: Figures in italic are estimated. 1. Wood includes wood, wood chips, straw and crop residues. Gas includes natural gas, LPG, biogas and ethanol. Kerosene also includes paraffin. Coal includes coal dust and lignite. Other includes missing data, 'no cooking in the house' as well as other fuels. 2. Access to modern fuels includes percent of population using electricity, gas or kerosene as primary cooking fuels. 3. Data refers to percentage of people with access.

Table 22. Use of improved cooking stoves, by country

Country	% of population relying on solid fuels for cooking that use improved cooking stoves[2]				Source(s)
	National	Rural	Urban	Year	
Bangladesh[3]	2.1	2.3	1.4	2007	Bangladesh Bureau of Statistics, UNICEF, 2007
Belize	8.3	6.8		2006	MICS and MDG Indicators, Belize, 2006
Brazil	53.5	64.9	47.1	2003	WHO, Household energy database
Burkina Faso	2.1	1.1	8.1	2003	WHO, Household energy database
Burundi	0.1	1.6	1.5	2005	ISTEEBU and UNICEF, 2008
Cambodia	6.7			2007	GERES, 2008 (author's calculation based on)

Country	% of population relying on solid fuels for cooking that use improved cooking stoves[2]				Source(s)
	National	Rural	Urban	Year	
Cameroon	2.6	2.2	3.4	2006	Ministère de l'Economie, De la Planification et de L'Aménagement du Territoire, Institut National de la statistique, UNICEF, 2007
Central African Republic	7.5	7.4	7.6	2006	Ministère du Plan, de l'Economie et de la Coopération International, Institut Centrafricain des Statistiques et des Etudes Economiques et Sociales, 2009,
Chad	21.6	23.5	14.6	2003	WHO, Household energy database
China	73.2	77.0	46.2	2003	WHO, Household energy database
Comoros	1.6	1.5	2.3	2003	WHO, Household energy database
Congo	14.7	13.7	14.8	2003	WHO, Household energy database
Côte d'Ivoire	6.3	5.7	7.5	2005	MICS 2005, personal communication
Dominican Republic	7.0	8.0	3.9	2003	WHO, Household energy database
Ecuador	7.5	7.3	8.4	2003	WHO, Household energy database
Egypt	5.3	5.4	4.6	2005	El-Zanaty F and Way A., 2006
Eritrea	2.1	1.5		2003-05	Ergeneman A., 2003; Habtetsion S., 2005
Ethiopia	2.8	2.3	7.6	2005	Central Statistical Agency and ORC Macro, 2006
Gambia	19.9	16.9	23.5	2005-06	Gambia Bureau of Statistics, 2007
Ghana[3]	0.2	0.3	0.1	2008	GSS, GHS, and ICF Macro, 2009
Guatemala	26.2	23.4	37.1	2003	WHO, Household energy database
Guinea-Bissau	51.1	53.8	46.2	2006	Ministère de l`Economie - Secrétariat d`Etat du Plan et à l`Intégration Régionale, 2006
Guyana	46.8	44.1	57.6	2005	Ministry of Health, Responsible Parenthood Association, and ORC Macro. 2006.
Haiti	99.8	99.9	99.8	2005	DHS, personal communication
Honduras	47.9	47.9	47.9	2005	DHS, personal communication
India	8.3	8.2	9.1	2005-06	IIPS and Macro International, 2007
Indonesia	5.1	5.4	4.6	2007	DHS, personal communication
Kenya	2.8	2.7	3.5	2003	WHO, Household energy database
Lao PDR	12.4	13.7	9.0	2006	Department of Statistics and UNICEF, 2008
Malawi	8.1	8.5	5.4	2006	National Statistical Office and UNICEF, 2008
Malaysia	6.5	9.6	0.0	2003	WHO, Household energy database
Mali	6.0	5.0	8.3	2003	WHO, Household energy database

Country	% of population relying on solid fuels for cooking that use improved cooking stoves[2]				Source(s)
	National	Rural	Urban	Year	
Marshall Islands[3]	5.8	1.5	27.5	2007	EPPSO, SPC and Macro International Inc., 2008.
Mauritania	28.0	26.9	30.4	2003	WHO, Household energy database
Mauritius	7.8	8.5	0.0	2003	WHO, Household energy database
Mexico	26.5	28.2	19.8	2003	WHO, Household energy database
Mongolia	99.1	99.2	99.0	2006	National Statistical Office, UNICEF, 2007
Morocco	0.0	0.0	0.0	2003	WHO, Household energy database
Myanmar	4.8	5.5	2.7	2003	WHO, Household energy database
Namibia	2.1	2.1	1.8	2006	DHS, personal communication
Nauru[3]	3.0		3.0	2007	Nauru Bureau of Statistics, SPC and Macro International Inc. 2007.
Nepal[3]	6.0	6.1	4.5	2006	UNDP, 2007; WHO, 2003
Niger	*8.7*			2007	GNESD, 2005 (author's calculation based on)
Nigeria	6.2	6.2	6.3	2007	MICS, personal communication
Pakistan	14.7	15.7	12.8	2003	WHO, Household energy database
Paraguay	21.7	25.8	12.5	2003	WHO, Household energy database
Peru	15.0	9.9	13.1	2004-07	DHS 2004-05, personal communication. National: Instituto nacional de estadistica e informatica, 2007
Philippines	16.1	16.3	15.7	2003	WHO, Household energy database
Senegal	16.3	15.7	18.5	2003	WHO, Household energy database
Sierra Leone	9.6	9.0	11.1	2006	Statistics Sierra Leone and UNICEF-Sierra Leone, 2007
Somalia	8.8	8.0	10.3	2006	UNICEF, 2006
South Africa	31.6	32.9	26.4	2003	WHO, Household energy database
Sri Lanka	41.2	41.1	43.0	2003	WHO, Household energy database
Swaziland	48.4	48.3	49.3	2003	WHO, Household energy database
Syrian Arab Republic	10.6	9.5	20.0	2005	MICS, personal communication
Tanzania	*0.72*			2004	GNESD, (not dated) (author's calculation based on)
Thailand	95.7	95.6	96.3	2005-06	Thailand National Statistical Office, 2006
Togo	3.1	1.4	5.6	2006	Direction Generale de la Statistique et de la Comptabilité Nationale, 2007

Country	% of population relying on solid fuels for cooking that use improved cooking stoves[2]				Source(s)
	National	Rural	Urban	Year	
Tunisia	15.2	17.0	12.2	2003	WHO, Household energy database
Uganda[3]	5.3	5.3	5.8	2006	UBOS and Macro International Inc., 2007
United Arab Emirates	0.0	0.0	0.0	2003	WHO, Household energy database
Uruguay	74.7	90.4	51.1	2003	WHO, Household energy database
Vanuatu	6.1	6.0	6.4	2007	Ministry of Health, Government of Vanuatu, 2008
Viet Nam	22.0	21.0	31.1	2006	General Statistics Office of Viet Nam, 2007
Zambia[3]	0.40	0.3	0.7	2007	CSO, MOH, TDRC, University of Zambia, and Macro International Inc., 2009
Zimbabwe	3.1	2.9	6.2	2005-06	CSO and Macro International Inc, 2007

Note: 1. Figures in italic are estimated. See Section II for details. Dates in italics are presumed based on available information. 2. Improved cooking stoves refer to closed stoves with chimney, as well as open stoves or fire with chimney of hood, but exclude open stoves or fire with no chimney or hood. Stoves for the use of electricity, liquid or gaseous fuels are not included. 3. Data refers to percentage of people with access.

Table 23. Access to mechanical power, by country

Country	% of population with access to mechanical power						Source(s)
	National	Year	Rural	Year	Urban	Year	
Benin			0	2005			République du Bénin, Ministère du Développement de l'Economie et des Finances, Ministère de l'Energie, des Mines et de l'Eau, 2006
Central African Republic			0	2000			MDGR, 2004
Mali			10	2004			ECOWAS, UEMOA, 2006

Table 24. Number of countries with available data on energy access

Region[1]	Electricity	Modern fuels[2]	Improved cooking stoves[3]	Mechanical power[4]
Developing countries	136	129	67	0
Rural data	125	113	63	3
Urban data	127	115	62	0
LDCs	49	46	28	0
SSA	45	43	30	0
Arab States	19	20	6	0
East Asia & Pacific	30	28	14	0
South Asia	9	9	5	0
LAC	32	27	14	0

Notes: (1) DC regions are based on UNDP's classification; LDCs are based on the UN's classification. Regional data exclude Southern Europe. (2) Modern fuels refer to liquid and gaseous fuels such as LPG, natural gas, and kerosene and exclude traditional biomass (e.g., firewood, charcoal, dung) and coal (including coal dust and lignite). (3) Improved cooking stoves refer to closed stoves with chimney, as well as open stoves or fires with chimney or hood, but exclude open stoves or fires with no chimney or hood. Stoves used for cooking with electricity, liquid fuels, or gaseous fuels are not included. (4) Mechanical power refers to the transmission of energy through a solid structure to impart motion such as for pumping, pushing, and other similar needs (e.g., for milling, grinding, water pumping) and is obtained from energy carriers (electricity; modern or traditional fuels) or energy sources transmitted directly (wind, hydraulic, geothermal).

Table 25. Percentage of population represented by available data on energy access

Region[1]	Electricity	Modern fuels[2]	Improved cooking stoves[3]	Mechanical power[4]
Developing countries	99.8	98.8	91.4	0.0
Rural data	99.8	97.6	91	0.5
Urban data	99.6	94.9	86.8	0.0
LDCs	98.9	99.8	71.8	0.0
SSA	100	99.9	77.1	0.0
Arab States	97.3	100	23.3	0.0
East Asia & Pacific	100	98.7	98.2	0.0
South Asia	100	100	97.8	0.0
LAC	99.9	93	75.1	0.0

Notes: (1) DC regions are based on UNDP's classification; LDCs are based on the UN's classification. Regional data exclude Southern Europe. (2) Modern fuels refer to liquid and gaseous fuels such as LPG, natural gas, and kerosene and exclude traditional biomass (e.g., firewood, charcoal, dung) and coal (including coal dust and lignite). (3) Improved cooking stoves refer to closed stoves with chimney, as well as open stoves or fires with chimney or hood, but exclude open stoves or fires with no chimney or hood. Stoves used for cooking with electricity, liquid fuels, or gaseous fuels are not included. Data based on population that rely on solid fuels. (4) Mechanical power refers to the transmission of energy through a solid structure to impart motion such as for pumping, pushing, and other similar needs (e.g., for milling, grinding, water pumping) and is obtained from energy carriers (electricity; modern or traditional fuels) or energy sources transmitted directly (wind, hydraulic, geothermal).

Table 26. Number of countries with data available on cooking fuels

Region	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal
Developing countries	112	112	112	126	127	127	126
Rural data	94	94	95	108	108	109	109
Urban data	95	95	95	115	115	115	115
LDCs	46	46	46	46	46	46	46
SSA	42	42	42	43	43	43	43
Arab States	14	14	14	19	19	19	19
East Asia & Pacific	25	25	25	28	28	28	28
South Asia	8	8	8	8	9	9	8
LAC	23	23	23	27	27	27	27

Notes: (1) DC regions are based on UNDP categories; LDCs are based on UN categories. Regional data exclude Southern Europe. (2) Gas includes LPG, natural gas, and biogas. Kerosene includes kerosene and paraffin. Wood includes wood, wood chips, straw, and crop residues.

Table 27. Percentage of population represented by available data on cooking fuels

Region	Electricity	Gas	Kerosene	Charcoal	Wood	Dung	Coal
Developing countries	94.8	94.8	94.8	95.9	97.3	97.3	95.9
Rural data	96.6	96.6	96.6	96.8	96.8	96.8	96.8
Urban data	90.0	90.0	90.0	94.9	94.9	94.9	94.9
LDCs	99.8	99.8	99.8	99.8	99.8	99.8	99.8
SSA	99.9	99.9	99.9	99.9	99.9	99.9	99.9
Arab States	88.4	88.4	88.4	98.1	98.1	98.1	98.1
East Asia & Pacific	98.1	98.1	98.1	98.7	98.7	98.7	98.7
South Asia	95.7	95.7	95.7	95.7	100.0	100.0	95.7
LAC	89.9	89.9	89.9	93.0	93.0	93.0	93.0

Notes: (1) DC regions are based on UNDP categories; LDCs are based on UN categories. Regional data exclude Southern Europe. (2) Gas includes LPG, natural gas, and biogas. Kerosene includes kerosene and paraffin. Wood includes wood, wood chips, straw, and crop residues.

Table 28. Targets for electricity access, by country

Country	Target as a % of the population with access						Source(s)
	National	Year	Rural	Year	Urban	Year	
Afghanistan	*35.8*	2011	25	2011	65	2011	PRSP, 2006
Angola	46	2015					World Bank, 2005
Bangladesh	100	2020	100	2020	100	2020	ESCAP, 2005
Benin	*73*	2015	42	2015	100	2015	Ministère du Développement de l'Economie et des Finances, Ministère de l'Energie, des Mines et de l'Eau, 2006
Bhutan	100	2020	100	2020	100	2020	United Nations, 2006
Bolivia	*90.7*	2015	70	2015	100	2015	Ministerio de Obras Publicas, Servicios y Vivienda, Viceminsterio de Electricidad y Energias, 2006
Botswana	100	2016	100	2016	100	2016	EIA, 2006 at http://www.eia.doe.gov/emeu/cabs/SADC/Electricity.html
Brazil	100	2015	100	2015	100	2015	IEA, 2003 at http://www.iea.org/Textbase/pm/?mode=weo&id=3422&action=detail
Burkina Faso	*48*	2015	36	2015	88	2015	Comité Régional Multisectoriel LOME, 2007
Cambodia	100	2020	100	2020	100	2020	Kunleang, 2007
Cameroon	*70*	2015	25	2015	100	2015	ESMAP, 2007
Cape Verde	80	2015					African Development Bank, 2008
Central African Republic	*15*	2015	10	2015	20	2015	MDGR, 2004
Chad	22	2010					Banque Africaine de Développment, Département Régional Centre ORCE, 2007
Chile	100	2010	100	2010	100	2010	GNESD, 2005
China	*99.7*	2015	*99.5*	2015	100	2015	Pan et al., 2006
Congo	*84.8*	2015	70	2015	95	*2015*	PRSP-Progress Report, 2005
Congo DR	*67*	2025	50	2025	90	2025	AllAfrica.com, May 2008
Costa Rica	100	2010	100	2010	100	2010	GTZ, 2007
Côte d'Ivoire	55	2015					PRSP, 2009
Djibouti	60	2015					Afrol News, 2008
Dominican Republic	95	2015	95	2020	100	2015	World Bank, 2007; GTZ, 2007

Country	Target as a % of the population with access						Source(s)
	National	Year	Rural	Year	Urban	Year	
Ecuador	*98.7*	2015	92	2012	100	2015	Consejo Nacional de Electricidad, 2007
El Salvador			93	2009			World Bank, 2006
Eritrea	*85.3*	2015	80	2015	100	2015	Habtetsion, 2005
Ethiopia	20	2012					Afrol News, 2008
Gambia	50	2011	*19*	2016			PRSP, 2008; Kite, 2005
Ghana	100	2020	100	2020	100	2020	Ghana Energy Commission, 2006
Guatemala	90	2010					Ministerio de Energía y Minas, 2007
Guinea	65	2015	40	2015	100	2015	UNDP, 2006
Haiti	50	2017					Bureau of Mines and Energy, Electricity of Haiti, 2006
Honduras	80	2015					PRSP, 2005
India	100	2012	100	2012	100	2012	Ailawadi and Bhattacharyya, 2006
Indonesia	90	2020	95	2025	100	2020	Hutapea, 2008
Jamaica	100	2020	100	2020	100	2020	Jamaica Cabinet Office
Kenya			40	2020			PRSP, 2005
Kiribati			75	*2015*			Solar Energy Company, 2004
Lao PDR	90	2020	70	2020	100	2020	ADB, 2006
Lesotho	35	2020					Department of Energy/Rural Electrification Unit, 2007
Liberia	10	2011	2	2011	*17.5*	2011	PRSP, 2008
Madagascar	*28.3*	2011	10	2011	74	2011	Gouvernement de Madagascar, 2006
Malawi	30	2020	10	2011			PRSP, 2007
Malaysia	*98.4*	2010	95.1	2010	100	2015	Economic Planning Unit, Prime Minister's Department
Mali	20.09	2011	8	2011	100	2015	PRSP, 2008
Mauritania	*64.8*	2015	12	2010	80	2015	Ministre du Pétrole et de l'Énergie (interview sur jeuneafrique.come)
Mongolia	100	2020	100	2020	100	2020	Ministry of Nature and Environment of Mongolia

Country	Target as a % of the population with access						Source(s)
	National	Year	Rural	Year	Urban	Year	
Mozambique	20	2020					Fond Africain de Development, 2006
Namibia	*50*	2010	25	2010	95	2010	EMCON, 2008
Nepal	100	2027	100	2027	100	2027	Government of Nepal National Planning Commission, 2007
Nicaragua			90	2013			National Energy Commission
Niger	*15*	2012	3	2012	46	2012	PRSP, 2007
Nigeria	60	2015	75	2020			Sambo; Lagos, 2007
Panama	95	2012	*87*	2012	100	2012	SESEM – CFT, 2005
Peru	91	2012	75	2012	*95.7*	2012	SESEM – CFT, 2005; World Bank, 2006
Philippines	90	2017	*66.5*	2017	100	2017	Philippines Department of Energy
Rwanda	35	2020	30	2020			UNEP, 2006
Senegal	66	2015	30	2015	*92.2*	2015	PRSP, 2007
Sierra Leone	35	2015					Kite, 2005
South Africa	100	2012	100	2012	100	2012	Winkler and Marquard, 2007
Sri Lanka	96	2016	70	2007			Ferdinando, 2007; ADB
Swaziland	100	2022	100	2022	100	2022	Swaziland Government, 2004
Tanzania	25	2010	15	2015	*60.5*	2015	Tanzania Electric Supply Company Limited, 2007; PRSP, 2005
Timor-Leste	80	2025					ADB, 2004
Togo	*66*	2015	40	2015	100	2015	UNDP, 2007
Tunisia	100	2010	100	2010	100	2010	UNDP, World Bank, 2005
Uganda	23	2010	10	2012			Ministry of Energy and Mineral Development, 2001
Viet Nam			100	2020			Vu Van Thai, 2006
Zambia	*41.8*	*2016*	15	*2016*	78	*2016*	Sibanda, 2006

Note: Figures in italic are estimated. See Section II for details. Dates in italics are presumed based on available information.

Table 29. Targets for access to modern fuels, by country

Country	Target as a % of the population with access						Source(s)
	National	Year	Rural	Year	Urban	Year	
Afghanistan	*13*	2015	10	2015	20	2015	PRSP, 2006
Benin	55	2015					Ministère du Développement de l'Economie et des Finances, Ministère de l'Energie, des Mines et de l'Eau, 2006
Cambodia	48	2015					PRSP, 2006
Cameroon	*66*	2016					ESMAP, 2007
Central African Republic	*15*	2015	10	2015	20	2015	MDGR, 2004
Côte d'Ivoire	60	2015					PRSP, 2009
Eritrea	*44.9*	2015	25	2015	100	2015	Habtetsion, 2005
Guinea	*24.4*	2015	20	2015	30	2015	UNDP, 2006
Haiti	*39.5*	2017					Bureau of Mines and Energy, Electricity of Haiti, 2006
Malawi	15.5	2011					PRSP, 2007
Mali	*54.1*	2015	50	2015	60	2015	République du Mali, 2008
Niger	*50.8*	2015	30	2015	100	2015	Secrétariat Permanent de la SRP
Tanzania	20	2010					PRSP, 2005
Togo	10	2015					PRSP, 2008
Uganda	*35*	2016					Sengendo et al., 2005
Viet Nam			80	2020			Vu Van Thai, 2006
Zambia	100	2030	100	2030	100	2030	Republic of Zambia, 2006

Note: Figures in italic are estimated. See Section II for details. Dates in italics are presumed based on available information.

Table 30. Targets for improved cooking stoves, by country

Country	Target as a % of the population with access to ICS						Source(s)
	National	Year	Rural	Year	Urban	Year	
Benin	45	2015					République du Bénin, Ministère du Développement de l'Economie et des Finances, Ministère de l'Energie, des Mines et de l'Eau, 2006
Bolivia	*4*	2010					https://www.gtz.de/en/themen/umwelt-infrastruktur/ energie/13885.htm (author's calculation based on)

Country	Target as a % of the population with access to ICS						Source(s)
	National	Year	Rural	Year	Urban	Year	
Eritrea	*55.1*	2015	75	2015	0	2015	Habtetsion S., 2005; Author's calculation
Guinea	*75.6*	2015	80	2015	70	2015	PNUD, 2006; Author's calculation
Haiti					17	2015	Bureau of Mines and Energy, Electricity of Haiti, 2006
India	*11.5*	2012					INSA, 2001 (author's calculation based on)
Kenya	*45.5*	2010	15	2010	80	2010	Ministry of energy, renewable energy department at http://www.energy.go.ke/index.php?option=com_content&task=view&id=7&Itemid=6; Author's calculation
Mali	40-50	2015					République du Mali, 2008
Morocco	*15.7*	2015					GNESD, 2005 (author's calculation based on)
Niger	*49.2*	2015	*70*	2015	*0*	2015	République du Niger (not dated) (author's calculation based on)
Togo	*40*	2015					PNUD, 2007 (author's calculation based on)
Uganda	*47*	2017	10	2010	30.7	2010	The Government of the Republic of Uganda, 2001; GNESD, 2005 (author's calculation based on)

Note: Figures in italic are estimated. See Section II for details. Dates in italics are presumed based on available information.

Table 31. Targets for mechanical power, by country

Country	Target as a % of the population with access to mechanical power						Source(s)
	National	Year	Rural	Year	Urban	Year	
Benin			100	2015			République du Bénin, Ministère du Développement de l'Economie et des Finances, Ministère de l'Energie, des Mines et de l'Eau, 2006
Cameroon			30	2015			ESMAP, 2007
Central African Republic			10	2015	20	2015	MDGR, 2004
Mali			100	2015			République du Mali, 2008
Togo			100	2015			PNUD, 2007

Table 32. Number of developing countries with energy access targets

	Total no. of countries	Number of countries with energy access targets			
		Electricity	Modern fuels	ICSs	Mechanical power
Developing countries	140	68	17	11	5
LDCs	50	25	8	4	0
SSA	45	35	13	7	5
Arab States	20	3	0	1	0
East Asia & Pacific	31	10	2	0	0
South Asia	9	6	1	1	0
LAC	33	14	1	2	0

Notes: (1) Figures represent the number of countries that have established a target either at the national level or for rural or urban areas. (2) DC regions are based on UNDP's classification; LDCs are based on the UN's classification. (3) Modern fuels refer to liquid and gaseous fuels such as LPG, natural gas, and kerosene and exclude traditional biomass (e.g., firewood, charcoal, dung) and coal (including coal dust and lignite). Improved cooking stoves refer to stoves in use only and may include ventilation systems with pipes, vents, and chimneys to remove indoor smoke, but exclude stoves used for cooking with electricity, liquid fuels, or gaseous fuels. Mechanical power refers to the transmission of energy through a solid structure to impart motion such as for pumping, pushing, and other similar needs (e.g., for milling, grinding, water pumping) and is obtained from energy carriers (electricity; modern or traditional fuels) or energy sources transmitted directly (wind, hydraulic, geothermal).

Table 33. Population of developing regions, 2007 and 2015

	Total population, 2007 (in millions)	Total population, 2015 (in millions)
Developing countries	5,357	5,951
LDCs	804	967
Sub-Saharan Africa	759	913
Arab States	327	380
EAP (excluding China)	663	722
China	1,329	1,389
South Asia (excluding India)	469	540
India	1,169	1,303
LAC	567	622
Southern Europe	76	83

Notes: (1) DC regions are based on UNDP's classification of countries; LDCs are based on the UN's classification. (2) Population figures from the UN Population Division.

APPENDIX 7: SOURCES CONSULTED

General

ADB. 2007. Key Indicators 2007, Volume 38.

Barnes, D.F., K. Openshaw, K.R. Smith, and R. van der Plas. 1994. 'What Makes People Cook with Improved Biomass Stoves? A Comparative International Review of Stove Programs.' World Bank Technical Paper No 242, Energy Series.

Clarke and Wallsten. 2002. Universal(ly Bad) Service: Providing Infrastructure Services to Rural and Poor Urban Consumers.

Desai, M.A., S.Mehta, and K.R. Smith. 2004. Indoor smoke from solid fuels: Assessing the environmental burden of disease at national and local levels. WHO Environmental Burden of Disease Series, No. 4. Geneva: World Health Organization.

ESMAP. 2003. Household Energy Use in Developing Countries: A Multicountry Study. Report 27588.

Geoghegan T., S. Anderson, and B. Dixon. 2008. Opportunities to achieve poverty reduction and climate change benefits through low carbon energy access programmes, A review of the portfolio of the Ashden Awards for Sustainable Energy, for the Department for International Development.

GNESD. (not dated). Poverty Reduction: Can Renewable Energy Make a Real Contribution?

GNESD. 2007. Reaching the Millennium Development Goals and beyond: Access to modern forms of energy as a prerequisite.

Gordon, B., R. Mackay, and E. Rehfuess. 2004. Inheriting the World: The Atlas of Children's Health and the Environment. WHO: Geneva, Switzerland.

GTZ. 2007. Energy-policy Framework Conditions for Electricity Markets and Renewable Energies, 23 Country Analyses.

IEA/OECD. 2004. World Energy Outlook 2004.

IEA/OECD. 2006. World Energy Outlook 2006.

IEA/OECD. 2009. World Energy Outlook 2009.

UN Millennium Project, UNDP, and ESMAP. 2005. Energy Services for the Millennium Development Goals. IBRD, World Bank, and UNDP.

UNCTAD. 2006. The Least Developed Countries, Report 2006.

UNDP. 2007. Human Development Indicators 2007.

UNDP. 2007a. A Review of Energy in National MDG Reports.

UNDP. 2007b. Energizing Poverty Reduction: A Review of the Energy-Poverty Nexus in Poverty Reduction Strategy Papers.

UNDP. 2007c. Energizing the Least Developed Countries to Achieve the Millennium Development Goals: The Challenges and Opportunities of Globalization, Making Globalization Work for the LDCs. Istanbul, 9-11 July 2007.

UNDP. 2006. Human Development Indicators 2006.

UNDP. 2005. MDG Monitoring and Reporting: A Review of Good Practices.

UNDP and ESMAP. 2005. Energy Services for the Millennium Development Goals, Achieving the Millennium Development Goals.

UNPD. 2006. World Population Prospect: The 2006 Revision Population Database.

WHO. 2006. Fuels for Life: Households Energy and Health.

World Bank. 2004. 'Scaling up Access to Energy: The Client's Perspective.' Presentation to the World Bank's Energy Week 2004, 12-18 March 2004, Washington, DC.

World Bank. 2007. 'Closing the Electricity Supply-Demand Gap.' Energy and Mining Sector Board Discussion Paper, Paper No. 20.

World Bank and IMF. 2007. Clean Energy for Development Investment Framework: The World Bank Group Action Plan, DC2007-0002.

Regional

Asia & Pacific

Castalia. 2004. Pacific Infrastructure Review, Background Paper, Final Report.

ESCAP. 2005. Electric Power in Asia and the Pacific, 2001 and 2002.

UNDP. 2005. Asia-Pacific Regional Energy Programme for Poverty Reduction (REP-POR), Pacific Rapid Assessment and Gap Analysis, Draft Final Report.

World Bank. 2001. Regulatory Framework and Transaction Models for Private Participation in Infrastructure in Pacific Islands Countries.

World Bank. 2006. The Pacific Infrastructure Challenge: A review of obstacles and opportunities for improving performance in the Pacific Islands.

Africa

African Development Bank Group. 2007. East Africa Energy Sector Challenges and Opportunities, Invest in Renewable Energies, East Africa Conference, September 2007, Frankfurt, Germany.

CEMAC. 2006. Cadre d'analyse logique du Plan d'Action.

EAC. 2007. Strategy On Scaling Up Access to Modern Energy Services In Order to Achieve The Millennium Development Goals.

ECOWAS, UEMOA. 2006. White Paper for a regional policy, geared towards increasing access to energy services for rural and periurban populations in order to achieve the Millennium Developments Goals.

FEMA. 2005. FEMA position paper: energy and the MDGs.

SAPP. 2007. Energising the region for economic development, Operational Report, Issue No. R03-07 (March 2007).

Southern African Development Community. (not dated). Regional Indicative Strategic Development Plan.

Latin America And Caribbean

ECLAC. 2008. Statistical yearbook for Latin America and the Caribbean, 2007.

GNESD. 2005. Workshop Summary Report (Draft), Latin American Regional Workshop on Electricity & Development, 13-14 April 2005, Rio de Janeiro, Brazil.

Mycoo, M. (not dated). Housing & Urban Management in the Caribbean.

SESEM – CFT. 2005. A Review of the Power Sector in Latin America and the Caribbean, Evolution in the Market and Investment Opportunities for CFTs, Securing Energy Supply and Enlarging Markets through Cleaner Fossil Technology.

Sources consulted, by country

Afghanistan

Nadiri, I. 2005. Interim Afghanistan National Development Strategy, Summary Report, An Interim Strategy For Security, Governance, Economic Growth & Poverty Reduction.

MDGR. 2005. Millennium Development Goals, Country Report 2005, Islamic Republic of Afghanistan, Vision 2020, UNDP.

Ministry of Rural Rehabilitation and Development and the Central Statistics Office. 2007. The National Risk and Vulnerability Assessment 2005, Kabul, Afghanistan.

PRSP. 2006. Afghanistan National Development Strategy: An Interim Strategy For Security, Governance, Economic Growth & Poverty Reduction, IMF.

WFP. 2004. Report on Findings from the 2003 National Risk and Vulnerability Assessment (NRVA) in Rural Afghanistan.

ALGERIA

MDGR. 2005. Governement Algérien, Rapport national sur les objectifs du Millénaire pour le développement, Algérie.

Office National des Statistiques, UNICEF. 2007. Résultats de l'Enquête Nationale à Indicateurs Multiples MICS3 Algérie 2006, Rapport Préliminaire.

Angola

CCA. 2002. Angola: The Post-War Challenges, Common Country Assessment, UN.

COSEP, Consultoria, Lda., Consaúde, Lda. 2007. Angola Malaria Indicator Survey, 2006-07.

World Bank. 2005. Private Solutions for Infrastructure in Angola: A Country Framework Report.

Antigua And Barbuda

Antigua & Barbuda Statistics Division of the Ministry of Finance and The Economy. 2004. Summary Social, Economic, Demographic, and Housing Characteristics, 2001 Census of Population and Housing.

Kairi Consultants, National Assessment Team of Antigua and Barbuda. 2007. Living Conditions in Antigua and Barbuda: Poverty in a Services Economy in Transition. Volume III Statistical and Technical Appendices to the SLC/HBS.

Argentina

INDEC. 2001 census at www.indec.gov.ar

MDGR. 2005. Millennium Development Goals: A commitment for poverty eradication, social integration and non-discrimination purposes, Country report 2005, Executive Summary, Republic of Argentina, Office of the President.

Bangladesh

Bangladesh Bureau of Statistics. 2004. Key Findings of the Poverty Monitoring Survey, 2004.

Bangladesh Bureau of Statistics. 2007. Key finding of HIES – 2005.

Bangladesh Bureau of Statistics. Statistics Bangladesh, 2006.

Bangladesh Bureau of Statistics, UNICEF. 2007. Bangladesh Multiple Indicator Cluster survey.

MDGR. 2005. Millennium Development Goals, Bangladesh Progress Report, UNDP.

National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. 2009. Bangladesh Demographic and Health Survey 2007. Dhaka, Bangladesh and Calverton, Maryland, USA: National Institute of Population Research and Training, Mitra and Associates, and Macro International.

PRSP. 2005. Bangladesh, Unlocking the Potential National Strategy for Accelerated Poverty Reduction, IMF.

Shrestha R.M et al. Undated. Institutional reforms and electricity access: lessons from Bangladesh and Thailand.

WHO. (not dated). World Health Survey Result 2003, Report of Bangladesh.

Belize

Central Statistical Office. (not dated). Belize. Population Census 2000, Major Findings.

MDGR. 2005. First Millennium Development Goals Report, Belize 2004, Ministry of National Development, Government of Belize, UNDP.

Ministerio de Obras Publicas, Servicios y Vivienda, Viceminsterio de Electricidad y Energias. 2006. Alernativas Program 'Electricidad para vivir con Dignidad'.

Multiple Indicator Cluster Surveys (MICS) and Millennium Development Goals (MDG) Indicators, Belize. 2006. Summary Table of Findings.

Statistical Institute of Belize. 2007. Results of the September 2007 Labor Force Survey.

Benin

ENDA. 2005. Monographie pays Benin, élaborée dans le cadre de la politique régionale pour 'L'accroissement de l'accès aux services énergétiques des populations rurales et périurbaines pour atteindre les objectifs du millénaire pour le développement', CEDEAO & UNDP – PREP.

[INSAE] Institut National de la Statistique et de l'Analyse Économique, République du Bénin. 2007. Bénin, Enquête Démographique et de Santé 2006.

MDGR. 2003. Premier Rapport sur les objectifs du Millénaire pour le Développement, UNDP.

PRSP. 2002. Benin Poverty Reduction Strategy Paper 2003-2005, IMF.

PRSP-Progress Report. 2004. Benin, Program For Strengthening the Observatory of Social Change, Progress Report on the Implementation of the PRSP 2003, IMF.

République du Bénin, Ministère du Développement de l'Economie et des Finances, Ministère de l'Energie, des Mines et de l'Eau. 2006. Stratégie pour la Fourniture d'Energie nécessaire pour l'Atteinte des OMD au Bénin, Version Définitive, UNDP.

Bhutan

ADB. 2002. Country Strategy and Program Update (2003–2005), Bhutan.

ADB. 2006. Technical Assistance Kingdom of Bhutan: Accelerated Rural Electrification.

JBIC. 2007. JBIC Provides First ODA Loan to Bhutan – Supporting Poverty Reduction through Rural Electrification.

MDGR. 2005. Millennium Development Goals Progress Report 2005, Bhutan, UNDP.

National Statistics Bureau, Royal Government of Bhutan. 2007. Bhutan Living Standard Survey 2007, Report.

Planning Commission, Royal Government of Bhutan. 1999. Bhutan 2020: A Vision for Peace, Prosperity and Happiness.

PRSP. 2004. Royal Government of Bhutan, Poverty Reduction Strategy Paper, A Cover Note to the Ninth Plan Main Document, IMF.

United Nations. 2006. An Update on the Progress of Implementation of the Brussels Programme of Action by the Royal Government of Bhutan.

Bolivia

Instituto Nacional de Estadística (INE), Ministerio de Salud y Deportes (MSD) et al. 2004. Encuesta Nacional de Demografía y Salud ENDSA 2003, Programa MEASURE DHS+/ORC Macro.

Instituto Nacional de Estadistica. 2009. Bolivia - Hogares: Combustible Utilizado Para Cocinar, Según Área Geográfica, 1998 - 2007, at http://www.ine.gov.bo/

Instituto Nacional de Estadistica. 2009. Bolivia - Hogares: Disponibilidad De Energía Eléctrica, Según Área Geográfica, 1997 - 2007, at http://www.ine.gov.bo/

Ministerio de Obras Publicas, Servicios y Vivienda, Viceminsterio de Electricidad y Energias. 2006. Alernativas Program 'Electricidad para vivir con Dignidad'.

Botswana

AREED. (not dated). Botswana: Basic Country Information.

Central Statistics Office. 2009. Botswana Demographic Survey 2006

Brazil

MDGR. 2004. Brazilian Monitoring Report on the Millennium Development Goals, UNDP.

WHO. (not dated). World Health Survey Result 2003, Report of Brazil.

Burkina Faso

Comité Régional Multisectoriel LOME. 2007. Burkina Faso, Etat d'Avancement de la Mise en Œuvre de la Politique Régionale pour l'Accès à l'Energie, Créer une vision, 4ème Réunion, 12 au 15 novembre 2007, UNDP, ECOWAS, UEOMA, Mepred.

Yaméogo, G. 2005. Monographie pays Burkina Faso, élaborée dans le cadre de la politique régionale pour 'l'accroissement de l'accès aux services énergétiques des populations rurales et périurbaines pour atteindre les objectifs du millénaire pour le développement', CEDEAO & UNDP – PREP.

IEPF. 2004. Actes du séminaire accès à l'énergie et lutte contre la pauvreté Ouagadougou, Burkina Faso, 10 au 12 mai 2004.

[INSD] Institut National de la Statistique et de la Démographie, Burkina Faso. 2006. Statistiques Structurelles (http://www.insd.bf/).

INSD and ORC Macro. 2004. Enquête Démographique et de Santé du Burkina Faso 2003. Calverton, Maryland, USA : INSD and ORC Macro.

Institut National de la Statistique et de la Démographie, UNICEF. 2008. Suivi de la Situation des Enfants et des Femmes, Enquête par Grappes à Indicateurs Multiples, 2006, Rapport final.

MDGR. 2003. Rapport Pays, Suivi des Objectifs du Millénaire pour le Développement, UNDP.

Ministère de l'Economie et des Finances, Institut National de la Statistique et de la Démographie. 2007. Analyse des résultats de l'enquête annuelle sur les conditions de vie des ménages en 2007 EA/QUIBB 2007.

ONAPAD, Burkin Faso. 2005. Données Pour suivre et évaluer la pauvreté et le développement humain durable, UNDP.

PRSP. 2004. Burkina Faso Poverty Reduction Strategy Paper, IMF.

PRSP-Progress Report. 2005. Burkina Faso, Poverty Reduction Strategy Paper, 2004 Implementation Report, Fifth Edition, IMF.

UNDP, Burkina Faso. 2007. Rapport sur le Développement Humain 2007, Sécurité Privé et Développement Humain.

WHO. (not dated). World Health Survey Result 2003, Report of Burkina Faso.

Burundi

Emerusenge, E. 2007. Projet Multisectoriel Infrastructures Eau et Energie, Cadre de Gestion Environnementale et Sociale, République du Burundi, Ministère de l'Eau, de l'Energie et des Mines, Régie de Production et de Distribution de l'Eau et de l'Electricité.

Institut de Statistitiques et d'Etudes Economiques du Burundi (ISTEEBU) and UNICEF. 2008. Enquête Nationale d'Evaluation des Conditions de vie de l'Enfant et de la Femme au Burundi-2005, MICS, Rapport définitif. World Bank, UNFPA.

MDGR. 2004. Rapport d'avancement - Objectifs du Millenaire pour le Developpement, UNDP.

PRSP. 2006. Republic of Burundi Poverty Reduction Strategy Paper, IMF.

WHO. (not dated). Word Health Survey Result 2003, Report of Burundi.

Cambodia

BCSE. 2005. Renewable Energy in Asia: The Cambodia Report. An overview of the energy systems, renewable energy options, initiatives, actors and opportunities in Cambodia.

GERES. 2008. Energy Globe Award: Reward for GERES Cambodia Program.

Kunleang, H. 2007. Rural Electrification by Renewable Energy in Cambodia, Capacity and Institutional Strenghtening for Rural Electrification and Development-Decentralized Energy Options, Vientiane, Lao PDR, 03-05 April 2007.

MDGR. 2003. Cambodia, Millennium Development Goals Report, UNDP.

National Institute of Public Health, National Institute of Statistics, Cambodia and ORC Macro. 2006. Cambodia Demographic and Health Survey 2005. Phnom Penh, Cambodia and Calverton, Maryland, USA: National Institute of Public Health, National Institute of Statistics and ORC Macro.

NEDO. 2002. Assistance Project for the Establishment of an Energy Master Plan for the Kingdom of Cambodia, Final Report.

PRSP. 2006. Cambodia: Poverty Reduction Strategy Paper, IMF.

Cameroon

ESMAP. 2007. Cameroun: Plan d'Action National Energie pour la Réduction de la Pauvreté, ESMAP Technical Paper 117/07 FR.

[INS] Institut National de la Statistique and ORC Macro. 2004. Enquête Démographique et de Santé du Cameroun 2004, Calverton, Maryland, USA: INS and ORC Macro.

MINEFI. 2007. Le secteur électrique au Cameroun, Ambassade de France au Cameroun, Mission Economique.

Ministère de l'Economie, de la Planification et de L'Aménagement du Territoire, Institut National de la statistique, UNICEF. 2007. Cameroun, Enquête par grappes à indicateurs multiples 2006, Suivi de la situation des enfants et des femmes, Rapport principal, MICS 2003.

Cape Verde

African Development Bank. 2008. Republic of Cape Verde, Completion Report 2005-2007, Results-based Country Strategy Paper, Country Operations Department, West Region 2 (ORWB).

Cape Verde. 2004. National Assessments of The Barbados Programme of Action + 10 Review.

MDGR. 2004. Objectifs du Millenaire pour le Developpement au Cap Vert, Rapport 2004, Une Evaluation des Efforts Accomplis, UNDP.

PRSP. 2004. Republic of Cape Verde, Growth and Poverty Reduction Strategy Paper, IMF.

PRSP-Progress Report. 2006. Implementation of the Growth and Poverty Reduction Strategy Cape Verde, IMF.

Republic of Cape Verde, Ministry of Finance and Public Administration. 2008. Poverty Reduction and Growth Strategy Paper – II.

Central African Republic

Institut Centrafricain des Statistiques, et des Etudes Economiques et Sociales. 2007. Suivi de la Situation des Enfants et des Femmes, Résultats de l'enquête à indicateurs multiples couplée avec la sérologie VIH et anémie en RCA, 2006, Rapport préliminaire, UNICEF.

MDGR. 2004. République Centrafricaine, Objectifs du Millénaire pour le Développement, Rapport National, 2003–2015, UNDP.

PRSP-Interim. 2000. Central African Republic, Preliminary Statement of the Government on the Poverty Reduction Strategy and Medium-Term Economic Policies, IMF.

République Centrafricaine, Direction Générale de la Statistique, des Études Économiques et Sociales. 2005. Troisième Recensement Général de la Population et de l'Habitation de 2003, Habitation et Environnement Immédiat, Rapport d'Analyse Thématique.

Chad

Bandoumal, O., K. Nodjimadji, et al. 2004. Enquête Démographique et de Santé Tchad 2004. Calverton, Maryland, U.S.A.: INSEED and ORC Macro.

Banque Africaine de Développment, Département Régional Centre ORCE. 2007. République du Tchad, Rapport de Revue à Mi-parcours du Document de Stratégie Pays Axée sur les Résultats DSPAR 2005-2009.

MDGR. 2002. Premier Rapport Pays sur la Mise en Œuvre de la Déclaration du Millénaire au TCHAD, UNDP.

Munkeni, F. 2006. Energie, Modernité et Lutte contre la Pauvreté, Communication faite aux Premières Journées Internationales d'Etudes Scientifiques sur le Thème: 'Le Tchad à l'Ere Pétrolière et son Développment Durable'.

PRSP. 2003. Republic of Chad, National Poverty Reduction Strategy Paper, IMF.

PRSP-Progress Report. 2005. Republic of Chad, National Poverty Reduction Strategy Monitoring and Implementation Report 2005, IMF.

UNCTAD. 2005. Statistical Profiles of the Least Developed Countries, United Nations, New York and Geneva

WHO. (not dated). World Health Survey Result 2003, Report of Chad.

Chile

IMF. 2007. Chile: 2007 Article IV Consultation—Staff Report; Public Information Notice on the Executive Board Discussion; and Statement by the Executive Director for Chile, IMF Country Report No. 07/333.

MDGR. 2005. Government of Chile, Millennium Development Goals, Executive Summary.

China

Carolina Population Center, National Institute of Nutrition and Food Safety. 2008. China Health and Nutrition Survey 2006, at http://www.cpc.unc.edu/projects/china.

MDGR. 2005. China's progress toward the Millennium Development Goals, Ministry of Foreign Affairs of the People's Republic of China, UNDP.

National Bureau of Statistics of China. National agriculture census 2008, at http://www.stats.gov.cn/

Pan, J., et al.. 2006. Rural Electrification in China 1950-2004: Historical processes and key driving forces. Program on Energy and Sustainable Development, Stanford University. Working Paper #60

Peabody, J.W., T.J. Riddell, K.R. Smith, Y. Liu, et al. 2005. Indoor Air Pollution in Rural China: Cooking Fuels, Stoves and Health Status, Archives of Environmental & Occupational Health; Mar/Apr 2005.

WHO. (not dated). World Health Survey Result 2003, Report of China.

World Bank. 2006. Migration in Towns in China, a Tale of Three Provinces: Evidence from Preliminary Tabulations of the 2000 Census, World Bank Policy Research Working Paper 3890.

Colombia

Asociación Probienestar de la Familia Colombiana Profamilia. 2005. Salud Sexual Y Reproductiva, Resultados Encuesta Nacional de Demografía y Salud 2005.

Comoros

Lachaud J.P. 2005. Pauvreté, inégalité et marché du travail dans l'Union des Comores, Eléments d'analyse fondés sur l'Enquête intégrale auprès des ménages de 2004. Union des Comores, Ministère du Plan et de l'Aménagement du Territoire, PNUD.

MDGR. 2003. Union Des Comores, Rapport National sur les Objectifs du Millénaire pour le Développement, Progrès, Revers et Défis, UNDP.

PRSP-Interim Report. 2005. Union of the Comoros, Poverty Reduction and Growth Strategy Paper, Updated Interim Paper, IMF.

WHO. (not dated). World Health Survey Result 2003, Report of Comoros.

Congo (Republic Of)

[CNSEE] Centre National de la Statistique et des Études Économiques and ORC Macro. 2006. Enquête Démographique et de Santé du Congo 2005. Calverton, Maryland, USA: CNSEE and ORC Macro.

PRSP-Progress Report. 2005. Republic of Congo: Interim Poverty Reduction Strategy Paper Progress Report, IMF Country Report No. 05/39.

WHO. (not dated). World Health Survey Result 2003, Report of Congo.

Congo (Democratic Republic Of)

MDGR. 2004. Objectifs du Millénaire pour le Développement, Rapport National de suivi de progrès pour la République, Démocratique du Congo 2004, UNDP.

Ministère du Plan and Macro International. 2008. Enquête Démographique et de Santé, République Démocratique du Congo 2007. Calverton, Maryland, U.S.A.: Ministère du Plan and Macro International.

PRSP. 2007. Democratic Republic of the Congo: Poverty Reduction Strategy Paper, IMF Country Report No. 07/330.

PRSP-Interim Report. 2002. Democratic Republic of the Congo, Interim Poverty Reduction Strategy Paper, IMF.

PRSP-I-Progress Report. 2004. Democratic Republic of the Congo, Second Progress Report on the I-PRSP Implementation and the Formulation of the Full PRSP June 2003-June 2004, IMF.

World Bank. 2007. Project Appraisal Document on a Proposed Grant in the Amount of SDR196.1 Million to the Democratic Republic of Congo for a Regional and Domestic Power Markets Development Project in Support of the Southern Africa Power Market Program.

Cook Islands

Cook Islands Statistics Office. 2008. Census 2006, Characteristics of private occupied dwelling.

Côsta Rica

Organizacion Panamericana de la Salud, Red Interamericana de Centros de Salud en la Vivienda. 2001. Diagnostico Salud en la Vivienda en Costa Rica.

Côte D'ivoire

ENDA. 2005. République de Côte d'Ivoire, Monographie Pays élaborée dans le Cadre de la Politique Régionale pour 'l'Accroissement de l'accès aux Services énergétiques des Populations Rurales et Périurbaines pour Atteindre les Objectifs du Millénaire pour le Développement'.

Institut National de la Statistique, Côte d'Ivoire. 2007. Enquête par grappes à indicateurs multiples Côte d'Ivoire 2006, UNICEF.

WHO. (not dated). World Health Survey Result 2003, Report of Côte d'Ivoire.

Cuba

Ahorra Energia. 2007. La Revolution Energetica en Cuba. Concepcion y Resultados, Medellín, 29 de Noviembre de 2007.

Reinmuller D. 2002. A comparison of Philosophies in Rural Electrification in Cuba, Mexico and South Africa, SEPCo Workshop II, 7 November 2002.

Djibouti

ESMAP. 2007. Potentiel de réduction des coûts de l'électricité et Stratégie sectorielle d'accroissement de l'accès à l'Energie en République de Djibouti.

Guelleh, I. 2005. Djibouti sur le chemin du Développement, Livre Blanc.

MDGR. 2005. Djibouti, Objectifs du Millénaire pour le Développement, UNDP.

PRSP. 2004. Republic of Djibouti: Poverty Reduction Strategy Paper, IMF.

Ministère de la Santé, République de Djibouti. 2007. Enquêtes Djiboutienne à Indicateurs Multiples 2006, Rapport préliminaire.

Dominica

PRSP. 2006. Dominica: Poverty Reduction Strategy Paper, IMF Country Report No. 06/289.

Dominican Republic

Centro de Estudios Sociales y Demográficos (CESDEM) y Macro International Inc. 2008. Encuesta Demográfica y de Salud 2007. Santo Domingo, República Dominicana: CESDEM y Macro International Inc.

Oficina Nacional de Estadistica, UNICEF. 2006. Encuesta Nacional de Hogares de Propósitos Múltiples 2006, ENHOGAR 2006, Informe de Avance de Resultados.

WHO. (not dated). World Health Survey Result 2003, Report of Dominican Republic.

Ecuador

Consejo Nacional de Electricidad, Ecuador. 2007. Plan Maestro de Electrificacion 2007-2016.

INEC, 2006, Las condiciones de Vida de Los Ecuatorianos, Resultados de la Encuesta de Condiciones de Vida - Quinta Ronda, Vivienda

Instituto Nacional de Estatistica y Censos. 2006. Encuesta de Condiciones de Vida at http://redatam.inec.gov.ec/

UNDESA. 2008. Commission on Sustainable Development, Ecuador, Case Study, Energy.

WHO. (not dated). World Health Survey Result 2003, Report of Ecuador.

Egypt

El-Zanaty F., and Way A.. 2006. Egypt Demographic and Health Survey 2005. Cairo, Egypt: Ministry of Health and Population, National Population Council, El-Zanaty and Associates, and ORC Macro.

El-Zanaty F. and Way A.. 2009. Egypt Demographic and Health Survey 2008. Cairo, Egypt: Ministry of Health, El-Zanaty and Associates, and Macro International.

UNDP. 2008. Egypt Human Development Report 2008, Egypt's Social Contract: The Role of Civil Society.

El Salvador

Dirección General de Estadística y Censos El Salvador, DIGESTYC, 2008, Encuesta de Hogares de Propósitos Múltiples 2007

World Bank. 2006. El Salvador Recent Economic Developments in Infrastructure - Strategy Report (REDI-SR), Infrastructure Service Provision in El Salvador: Fighting Poverty, Resuming Growth, Report No. 37689-SV.

Equatorial Guinea

CCA. 2006. République de Guinée Equatoriale, Bilan Commun de Pays.

Eritrea

Embassy of Japan. Investment Opportunities in the Energy Sector of Eritrea, USAID (http://www.embassy-avenue.jp/eritrea/profile/).

CCA. 2001. Eritrea, Common Country Assessment, UN.

Ergeneman, A. 2003. Dissemination of Improved Cookstoves in Rural Areas of the Developing World: Recommendations for the Eritrea Dissemination of Improved Stoves Program, Eritrea Energy Research and Training Center (http://www.crest.org/discussiongroups/resources/stoves/Vanbuskirk/EriStoveAPAReport.htm#_ftn11).

Habtetsion, S. 2005. Energy Needs for Achieving MDGs in Eritrea, Department of Energy, Eritrea.

[NSEO] National Statistics and Evaluation Office, (Eritrea) and ORC Macro. 2003. Eritrea Demographic and Health Survey 2002. Calverton, Maryland, USA: National Statistics and Evaluation Office and ORC Macro.

Ethiopia

Central Statistical Agency [Ethiopia] and ORC Macro. 2006. Ethiopia Demographic and Health Survey 2005, Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Agency and ORC Macro.

Ethiopia Central Statistical Authority. 2005. Ethiopia Welfare Monitoring Survey 2004.

MDGR. 2004. Millennium Development Goals Report, Challenges and Prospects for Ethiopia, UNDP.

PRSP. 2002. Ethiopia: Sustainable Development and Poverty Reduction Program, IMF.

PRSP-Progress Report. 2005. Ethiopia: Sustainable Development and Poverty Reduction Program (SDPRP), Annual Progress Report (2003/04), IMF.

UNCTAD. 2005. Statistical Profiles of the Least Developed Countries, Ethiopia.

WHO. (not dated). World Health Survey Result 2003, Report of Ethiopia.

World Bank. 2007. Project Appraisal Document on a Proposed Credit in the Amount of Sdr 86.0 Million to the Federal Democratic Republic of Ethiopia for a Second Electricity Access Rural Expansion Project.

Fiji

ADB. (not dated). Fiji Islands, Country Strategy And Program Update (2004-2006).

MDGR. 2004. Millennium Development Goals Fiji National Report, National Planning Office, Ministry of Finance and National Planning.

ADB. 2005. Republic of the Fiji Islands: Rural Electrification Project, Technical Assistance Consultant's Report, Project Number: 35487.

Gabon

DGSEE Republique Gabonaise. 2001. Enquête Démographique et de Santé Gabon 2000 - Final Report.

Direction Générale de la Statistique et des Études Économiques (DGSEE) [Gabon] and ORC Macro. 2001. Enquête Démographique et de Santé Gabon 2000. Calverton, Maryland : Direction Générale de la Satistique et des Études Économiques, et Fonds des Nations Unies pour la Populations, and ORC Macro.

World Bank. 2006. Gabon - Diagnostique de la pauvreté, Report Nr. 34490-GA.

Gambia

Gambia Bureau of Statistics (GBoS). 2007. The Gambia Multiple Indicator Cluster Survey 2005/2006 Report, Banjul.

Gambia Bureau of Statistics. 2007. Monitoring the Situation of Children and Women, Findings from the Gambia Multiple Indicator Cluster Survey 2005/2006, Preliminary Report, UNICEF.

KITE. 2005. The Gambia Country Report for Regional Policy Base on 'Increasing Access to Energy Services for Populations in Rural and Sub Urban Areas in order to Achieve the Millennium Development Goals', UNDP-REPP & ECOWAS.

MDGR. 2005. Reaching Out to the People: A Review of Progress toward achieving the Millennium Development Goals at the Local Level in the Gambia.

PRSP. 2002. The Republic of Gambia, Strategy for Poverty Alleviation, IMF.

PRSP-Progress Report. 2006. The Gambia: Poverty Reduction Strategy Paper—Second Annual Progress Report, January-December 2004, IMF.

Republic of the Gambia. 2006. Poverty Reduction Strategy: 2007-2011.

UNCTAD. 2005. Statistical Profiles of the Least Developed Countries, Gambia.

UNICEF. 2003. Government of Gambia, Baseline Survey In Lower, Central And Upper River Divisions, 2002.

Ghana

Ghana Energy Commission. 2006. Strategic National Energy Plan 2006 – 2020, Main Report.

Ghana Statistical Service (GSS), Ghana Health Service (GHS), and ICF Macro. 2009. Ghana Demographic and Health Survey 2008. Accra, Ghana: GSS, GHS, and ICF Macro.

Ghana Statistical Service (GSS), Noguchi Memorial Institute for Medical Research (NMIMR), and ORC Macro. 2004. Ghana Demographic and Health Survey 2003. Calverton, Maryland: GSS, NMIMR, and ORC Macro.

Statistical Service Ghana. 2007. Monitoring the Situation of Children and Women: Findings from the Ghana Multiple Indicator Cluster Survey 2006, Preliminary Report, UNICEF.

WHO. (not dated). World Health Survey Result 2003, Report of Ghana.

Grenada

KAIRI. 1999. Poverty Assessment Report, Grenada, Volume 2 of 2, Appendices.

PRSP-Interim. 2006. Grenada: Interim Poverty Reduction Strategy Paper, IMF Country Report No. 06/280.

Guatemala

Ahmed, K., Y. Awe, et al. 2005. Environmental Health and Traditional Fuel Use in Guatemala, ESMAP.

República de Guatemala, Ministerio de Energía y Minas. 2007. Politica Energetica y Minera, 2008-2015.

WHO. (not dated). World Health Survey Result 2003, Report of Guatemala.

Guinea

Direction Nationale de la Statistique (DNS) (Guinée) and ORC Macro. 2006. Enquête Démographique et de Santé, Guinée 2005. Calverton, Maryland, U.S.A. : DNS and ORC Macro.

ESMAP. 1999. Guinea, Households Energy Strategy.

MDGR. 2007. Rapport National sur les Objectifs de la Déclaration du Millénaire, UNDP.

UNDP. 2006. OMD Présentation du Rapport Diagnostic Secteur Energie.

PRSP. 2002. Republic of Guinea, Poverty Reduction Strategy Paper, IMF.

PRSP-Progress Report. 2006. Republic of Guinea, Third Progress Report on the Poverty Reduction Strategy, IMF.

Guinea-Bissau

ENDA. 2005. Monographie pays Guinée Buissau, élaborée dans le cadre de la politique régionale pour 'l'accroissement de l'accès aux services énergétiques des populations rurales et périurbaines pour atteindre les objectifs du millénaire pour le développement', CEDEAO & UNDP – PREP.

Ministère de l`Economie - Secrétariat d`Etat du Plan et à l`Intégration Régionale. 2006. Enquête par Grappes à Indicateurs Multiples, Guinée-Bissau, 2006, Rapport Final, Bissau, Guinée-Bissau : Ministère de l`Economie - Secrétariat d`Etat du Plan et à l`Intégration Régionale.

PRSP-Interim. 2000. Guinea-Bissau Interim National Poverty Reduction Strategy Paper, IMF.

Guyana

Bureau of Statistics, Guyana. 2007. Population and Housing Census - 2002, Table 26. Neighbourhood Democratic Councils - Households by Type of Lighting.

Bureau of Statistics, Guyana. 2007. Population and Housing Census 2002, National Census Report, Chapter VII: Housing and Living Arrangements.

Bureau of Statistics and UNICEF. 2008. Guyana Multiple Indicator Cluster Survey 2006, Final Report. Georgetown, Guyana: Bureau of Statistics and UNICEF.

MDGR. 2007. Guyana Millennium Development Goals 2007, UNDP.

Ministry of Health Georgetown, Guyana. 2006. Guyana HIV/AIDS Indicator Survey 2005, USAID.

Haiti

Bureau of Mines and Energy, Electricity of Haiti. 2006. Haiti Energy Sector Development Plan 2007–2017.

Cayemittes, Michel, Marie Florence Placide, Soumaïla Mariko, Bernard Barrère, Blaise Sévère, and Canez Alexandre. 2007. Enquête Mortalité, Morbidité et Utilisation des Services, Haïti, 2005-2006. Calverton, Maryland, USA : Ministère de la Santé Publique et de la Population, Institut Haïtien de l'Enfance, and Macro International Inc.

MDGR. 2004. Rapport National sur les Objectifs du Millénaire pour le Développement, UNDP.

UNDP. 2004. La vulnérabilité en Haïti: Chemin inévitable vers la pauvreté? Rapport national sur le développement humain – Haïti.

PRSP. 2008. Haiti: Poverty Reduction Strategy Paper, IMF Country Report No. 08/115.

Honduras

PRSP. 2005. Honduras: Poverty Reduction Strategy Paper Progress Report, IMF Country Report No. 05/82.

Secretaría de Salud [Honduras], Instituto Nacional de Estadística (INE), and Macro International. 2006. Encuesta Nacional de Salud y Demografía 2005-2006. Tegucigalpa, Honduras: SS, INE and Macro International.

India

Ailawadi, V. S. and Bhattacharyya, S.C. 2006. Access to energy services by the poor in India: Current situation and need for alternative strategies, Natural Resources Forum 30 (2006) 2–14.

INSA. 2001. Pursuit and Promotion of Science: The Indian Experience, Ch. 34: Ministry of Non-conventional Energy Sources.

International Institute for Population Sciences (IIPS) and Macro International. 2007. National Family Health Survey (NFHS-3), 2005–06: India: Volume I. Mumbai: IIPS.

WHO. (not dated). World Health Survey Result 2003, Report of India.

Indonesia

Badan Pusat Statistik-Statistics Indonesia (BPS) and ORC Macro. 2003. Indonesia Demographic and Health Survey 2002-2003. Calverton, Maryland, USA: BPS and ORC Macro.

Hutapea, M. 2008. Generating Dialogue Clean Energy, Good Governance and Regulation, Ministry of Energy and Mineral Resources, Singapore, 17-18 March 2008.

Kusdiana D., Saptono A. 2008. Implementation of Rural Energy by Renewable Energy in Indonesia, Directorate General of Electricity and Energy Utilization, Ministry of Energy and Mineral Resources, Workshop on Rural Energization Paris, May 28-29, 2008.

Statistics Indonesia (Badan Pusat Statistik—BPS) and Macro International. 2008. Indonesia Demographic and Health Survey 2007. Calverton, Maryland, USA: BPS and Macro International.

World Bank. 2005. Electricity for All: Options for Increasing Access in Indonesia.

Iran

Statistical Center of Iran. (not dated). Summary Results of the Urban and Rural Household Income and Expenditure Survey-2006.

Iraq

Central Organization for Statistics & Information Technology and Kurdistan Regional Statistics Office. 2007. Iraq Multiple Indicator Cluster Survey 2006, Final Report. Iraq.

Iraq Ministry of Planning and Development Cooperation. 2005. Iraq Living Conditions Survey 2004, Volume I: Tabulation Report, UNDP.

Jamaica

Jamaica Cabinet Office. (not dated). Green Paper, The Jamaica Energy Policy 2006 – 2020.

MDGR. 2004. Millennium Development Goals Jamaica, UNDP.

Jordan

Department of Statistics [Jordan] and ORC Macro. 2003. Jordan Population and Family Health Survey 2002. Calverton, Maryland, USA: Department of Statistics and ORC Macro.

Department of Statistics [Jordan] and Macro International Inc. 2008. Jordan Population and Family Health Survey 2007, Calverton, Maryland, USA: Department of Statistics and Macro International Inc.

Kenya

Central Bureau of Statistics (CBS) [Kenya], Ministry of Health (MOH) [Kenya], and ORC Macro. 2004. Kenya Demographic and Health Survey 2003. Calverton, Maryland: CBS, MOH, and ORC Macro.

Kenya Ministry of Energy. 2007. Strategic Plan 2004 - 2009, Revised Draft, March 2007.

Kenya National Bureau of Statistics. 2009. Kenya Integrated Household Budget Survey, 2005-2006 at http://www.cbs.go.ke/

Ministry of Energy, Kenya. 2008. Opening Speech by the Permanent Secretary, Ministry of Energy, At the Public Sector Workshop on Formulation of a Strategy, Action Plan and Regulations for Woodfuel Development, Westlands, 26th March 2008.

PRSP. 2005. Kenya: Poverty Reduction Strategy Paper, IMF Country Report No. 05/11.

Theuri, D. (not dated). Rural Energy, Stoves and Indoor Air Quality: The Kenyan Experience, ITDG.

WHO. (not dated). World Health Survey Result 2003, Report of Kenya.

Kiribati

PIREP. 2004. Pacific Regional Energy Assessment, Kiribati National Report Volume 5, GEF, UNDP, SPREP and the Pacific Islands.

Solar Energy Company. 2004. Improving the Living Standard of an I-Kiribati, Solar Energy for Outer Islands – Kiribati.

Lao People's Democratic Republic

ADB. 2006. Lao People's Democratic Republic 2007–2011Country Strategy and Program.

Department of Statistics and UNICEF. 2008. Lao PDR Multiple Indicator Cluster Survey 2006, Final Report. Vientiane, Lao PDR: Department of Statistics and UNICEF.

MDGR. 2004. Millennium Development Goals Progress Report, Lao PDR.

National Statistics Centre of the Lao PDR. (not dated). Results from the Population Census 2005.

PRSP. 2004. Lao People's Democratic Republic, National Growth and Poverty Eradication Strategy, IMF.

UNDP. 2006. National Human Development Report International Trade and Human Development, Lao PDR.

WHO. (not dated). World Health Survey Result 2003, Report of Lao PDR.

Lebanon

Lebanese Republic Ministry of Social Affairs, UNDP. 2006. Living Conditions of Households. The National Survey of Household Living Conditions.

Lesotho

Department of Energy/Rural Electrification Unit. 2007. Lesotho Renewable Energy-Based Rural Electrification Project, Quarterly Progress Report, June – August 2007, GEF, UNDP.

Government of Lesotho. 2004. Invitation to Qualify for the Privatisation of the Lesotho Electricity Corporation.

Lesotho Electricity Authority. 2006. Energy Policy for the Kingdom of Lesotho, Draft.

Ministry of Health and Social Welfare (MOHSW) [Lesotho], Bureau of Statistics (BOS) [Lesotho], and ORC Macro. 2005. Lesotho Demographic and Health Survey 2004. Calverton, Maryland: MOH, BOS, and ORC Macro.

PRSP. 2006. Kingdom of Lesotho: Poverty Reduction Strategy Paper, 2004/2005 – 2006/2007, IMF.

Liberia

CCA. 2006. Common Country Assessment for Liberia, Consolidating Peace and National Recovery for Sustainable Development, UN.

Liberia Institute of Statistics and Geo-Information Services (LISGIS) [Liberia], Ministry of Health and Social Welfare [Liberia], National AIDS Control Program [Liberia], and Macro International Inc. 2008. Liberia Demographic and Health Survey 2007, Monrovia, Liberia: Liberia Institute of Statistics and Geo-Information Services (LISGIS) and Macro International Inc.

MDGR. 2004. Republic of Liberia, Millennium Development Goals Report 2004.

PRSP-Interim. 2007. Republic of Liberia: Interim Poverty Reduction Strategy Paper, Breaking with the Past: from Conflict to Development, IMF.

Republique of Liberia. 2008. Poverty Reduction Strategy.

Madagascar

Gouvernement de Madagascar. 2006. Plan d'Action Madagascar, 2007-2012, Un Plan Audacieux pour le Développement Rapide.

INSTAT (Institut National de la Statistique à Madagascar) and ORC Macro. 2005. Enquête Démographique et de Santé, Madagascar 2003–2004 : Rapport de synthèse.

INSTAT, Ministère de l'Economie, des Finances et du Budget. 2006. Enquête permanente auprès des ménages 2005, Rapport principal

MDGR. 2001. Madagascar en 2015, Les perceptions du futur par les communautés de base malgaches.

MINEFI. 2007. Fiche de Synthèse, l'Electricité à Madagascar.

PRSP. 2007. Madagascar Action Plan 2007–2012, A Bold and Exciting Plan for Rapid Development, IMF.

Malawi

ESMAP. 2005. Malawi: Rural Energy and Institutional Development.

MDGR. 2003. Republic of Malawi, Millennium Development Goals Report, 2003, UNDP.

National Statistical Office (NSO) [Malawi], and ORC Macro. 2005. Malawi Demographic and Health Survey 2004, Calverton, Maryland: NSO and ORC Macro.

National Statistical Office and UNICEF. 2008. Malawi Multiple Indicator Cluster Survey 2006, Final Report. Lilongwe, Malawi: National Statistical Office and UNICEF.

National Statistical Office Malawi. 2007. Malawi 2006 Welfare Monitoring Survey.

National Statistical Office Zomba, Malawi, UNICEF. 2007. Malawi Multiple Indicator Cluster Survey 2006, Preliminary Report, Monitoring the Situation of Children and Women.

PRSP. 2007. Malawi, Growth and Development Strategy, From Poverty to Prosperity, 2006-2011, IMF.

WHO. (not dated). World Health Survey Result 2003, Report of Malawi.

Malaysia

Kasbani A. 2006. Gap Analysis on Access to Energy for the Poor Malaysia. UNDP.

WHO. (not dated). World Health Survey Result 2003, Report of Malaysia.

Maldives

MDGR. 2005. Millennium Development Goals, Maldives Country Report.

Ministry of Planning and National Development, Republic of Maldives. Census Analysis 2006, Housing Conditions & Housing Amenities.

Republic of Maldives, Ministry of Planning and National Development. 2004. Vulnerability and Poverty Assessment.

World Bank. 2006. The Maldives: Sustaining Growth & Improving The Investment Climate.

Mali

Cellule de Planification et de Statistique du Ministère de la Santé (CPS/MS), Direction Nationale de la Statistique et de l'Informatique (DNSI), and ORC Macro. 2002. Enquête Démographique et de Santé au Mali 2001. Calverton, Maryland, USA : CPS/MS, DNSI and ORC Macro.

Cellule de Planification et de Statistique du Ministère de la Santé (CPS/MS), Direction Nationale de la Statistique et de l'Informatique du Ministère de l'Économie, de l'Industrie et du Commerce (DNSI/MEIC) and Macro International Inc. 2007. Enquête Démographique et de Santé du Mali 2006. Calverton, Maryland, USA : CPS/DNSI and Macro International Inc.

Diallo, S. 2005. Monographie pays Mali, élaborée dans le cadre de la politique régionale pour 'L'accroissement de l'accès aux services énergétiques des populations rurales et périurbaines pour atteindre les objectifs du millénaire pour le développement', CEDEAO & UNDP – PREP.

Hantafaye, H., Direction Nationale de l'Energie. (not dated). Présentation de la Situation et Politique énergétique au Mali.

MDGR. 2004. République du Mali, Rapport de suivi de la mise en œuvre des Objectifs du Millénaire pour le Développement (OMD), UNDP.

PRSP. 2008. Mali: Poverty Reduction Strategy Paper, IMF Country Report No. 08/121.

PRSP-Implementation Report. 2005. PRSP Implementation Report 2003 And 2004, IMF.

République du Mali. 2008. Plan Décennal pour la Réalisation des Objectifs du Millénaire pour le Développement (OMD) 2006-2015.

République du Mali, Ministère de la Promotion de la Femme, de l'Enfant et de la Famille. 2006. Programme National de développement des Plates-Formes Multifonctionnelles – Mali (PN/PTF).

WHO. (not dated). World Health Survey Result 2003, Report of Mali.

Marshall Islands

Economic Policy, Planning and Statistics Office (EPPSO), SPC and Macro International Inc. 2008. Republic of the Marshall Islands Demographic and Health Survey 2007.

EPPSO. 2006. RMI 2006 Community Survey, Summary of Survey Results.

Government of Marshall Islands, 2001, Marshall Islands National Energy Policy 2002, 2nd Economic & Social Summit 2001

RMI Economic Policy, Planning and Statistics Office. 2006. 2006 RMI Community Survey Final Population Tables.

Mauritania

MDGR. 2005. Rapport sur les progrès dans la mise en oeuvre des Objectifs du Millénaire pour le Développement en Mauritanie, UNDP.

Office National de la Statistique (ONS). 2006. Profil de la Pauvreté en Mauritanie, 2004.

Office National de la Statistitique and UNICEF. 2008. Mauritanie, Enquête par Grappes à Indicateurs Multiples 2007, Rapport Final.

PRSP. 2006. Islamic Republic of Mauritania: Poverty Reduction Strategy Paper, Action Plan 2006–2010, IMF.

WHO. (not dated). World Health Survey Result 2003, Report of Mauritania.

Mauritius

Central Statistics Office, Ministry of Economic Development, Financial Services and Corporate Affairs. 2003. Mauritius, 2000 Housing and Population Census Housing and Household characteristics – Main Results.

Central Statistics Office, Ministry of Finance and Economic Development. 2004. Continuous Multi-Purpose Household Survey - First Quarter 2004, Main results

WHO. (not dated). World Health Survey Result 2003, Report of Mauritius.

Mexico

INEGI. 2005. Mexico at a Glance, 2005 Edition.

WHO. (not dated). World Health Survey Result 2003, Report of Mexico.

Micronesia

Government of the Federated States of Micronesia. 2008. Analysis of the 2005 Household Income and Expenditure Survey, A report on the estimation of basic needs poverty lines, and the incidence and characteristics of poverty in Federated States of Micronesia, UNDP.

PIREP. 2004. Pacific Regional Energy Assessment, Federates States of Micronesia, National Report Volume 3, GEF, UNDP, SPREP and the Pacific Islands.

Mongolia

Agchbayar Dorj. (not dated). Mongolia - Energy Access in Rural Areas, Solar PV System's Service Co. Ltd.

MDGR. 2007. The Millennium Development Goals Implementation in Mongolia: Second National Report, Ministry of Finance, Mongolia.

Ministry of Nature and Environment of Mongolia. (not dated). Mongolia National Renewable Energy Program.

National Statistical Office, UNICEF. 2007. Mongolia 'Child and Development 2005' survey (MICS-3), Final Report. Ulaanbaatar, Mongolia.

Morocco

MDGR. 2003. Rapport National relatif aux Objectifs du Millénaire pour le Développement, Royaume du Maroc, UNDP.

Ministère de la Santé [Maroc], ORC Macro, and Ligue des États Arabes. 2005. Enquête sur la Population et la Santé Familiale (EPSF) 2003-2004. Calverton, Maryland, USA : Ministère de la Santé and ORC Macro.

ONE. 2008. L'Electrification Rurale au Maroc, Une Expérience à Partager.

WHO. (not dated). World Health Survey Result 2003, Report of Morocco.

Mozambique

Gwatkin, D.R., et al. 2003. Socio-Economic Differences in Health, Nutrition, and Population, Mozambique 1997–2003.

Fond Africain de Development. 2006. Republique du Mozambique, Quatrième Projet d'Electricité, Rapport d'Evaluation.

Instituto Nacional de Estatística Maputo, Moçambique, Ministério da Saúde Maputo, Moçambique, and ORC Macro. 2005. Moçambique Inquérito Demográfico e de Saúde 2003.

MDGR. 2005. Report on the Millennium Development Goals, Republic of Mozambique, UNDP.

PRSP. 2006. Republic of Mozambique, Action Plan for the Reduction of Absolute Poverty 2006–2009, IMF.

Myanmar

MDGR. 2005. Millennium Development Goals Report of Myanmar, Ministry of National Planning and Economic Development.

WHO. (not dated). World Health Survey Result 2003, Report of Myanmar.

Namibia

EMCON. 2008. Impact Assessment of Norad-Funded Rural Electrification Interventions in Northern Namibia, 1990-2000, Norad Collected Reviews.

Ministry of Health and Social Services (MoHSS) [Namibia], Macro International Inc.. 2008. Namibia Demographic and Health Survey 2006-07, Windhoek, Namibia and Calverton, Maryland, USA: MoHSS and Macro International Inc.

Ministry of Health and Social Services, Namibia. 2003. Namibia Demographic and Health Survey 2000.

WHO. (not dated). World Health Survey Result 2003, Report of Namibia.

Nauru

Nauru Bureau of Statistics, SPC and Macro International Inc. 2007. Nauru 2007 Demographic and Health Survey.

PIREP. 2004. Pacific Regional Energy Assessment, Nauru National Report Volume 7, GEF, UNDP, SPREP, and the Pacific Islands.

Nepal

Central Bureau of Statistics of Nepal. 2004. Nepal Living Standards Survey 2003/04 Statistical Report, Volume One.

Government of Nepal National Planning Commission. 2007. Three Year Interim Plan (2007/08 – 2009/10), Ch. 31.

MDGR. 2005. Nepal Millennium Development Goals, Progress Report 2005, UNDP.

Ministry of Health and Population (MOHP) [Nepal], New ERA, and Macro International Inc. 2007. Nepal Demographic and Health Survey 2006. Kathmandu, Nepal: Ministry of Health and Population, New ERA, and Macro International Inc.

PRSP. 2003. The Tenth Plan, Poverty Reduction Strategy Paper, 2002-2007, IMF.

PRSP-Progress Report. 2006. An Assessment of the Implementation of the Tenth Plan/ PRSP Review 2005/2006, IMF.

UNDP. 2007. Review of the Improved Cooking Stoves (ICS) Programme in Nepal.

WHO. (not dated). World Health Survey Result 2003, Report of Nepal.

Nicaragua

Instituto Nacional de Estadísticas y Censos, Ministerio de Salud, and ORC Macro. 2002. Encuesta Nicaraguense de Demografía y Salud 2001.

Instituto Nacional de Información de Desarrollo (INIDE), Ministerio de Salud (MINSA). 2008. Encuesta Nicaragüense de Demografía y Salud ENDESA 2006/07, Informe Final.

Niger

Institut National de la Statistique (INS) and Macro International Inc. 2007. Enquête Démographique et de Santé et à Indicateurs Multiples du Niger 2006. Calverton, Maryland, USA : INS and Macro International Inc.

MDGR. 2003. Rapport National sur le Progrès vers les Objectifs du Millénaire pour le Développement, UNDP.

PRSP. 2002. République du Niger, Poverty Reduction Strategy, Le Niger contre la Pauvreté.

PRSP-Status Report. 2006. Niger: Poverty Reduction Strategy Paper—2005 Status Report, IMF.

République du Niger, Cabinet du Premier Ministre, Secrétariat Permanent de la SRP, Stratégie de Réduction de la Pauvreté, Deuxième génération, Stratégie de Développement Accelere et de Reduction de la Pauvreté, 2008 – 2012.

Nigeria

National Bureau of Statistics, UNICEF. 2007. Nigeria Multiple Indicator Cluster Survey 2007, Preliminary Report.

National Population Commission, Federal Republic of Nigeria. 2004. 2003 Demographic and Health Survey of Nigeria.

Sambo, A.S. (not dated). Renewable Energy Masterplan for a Developing Nation: The Case of Nigeria, Energy Commission of Nigeria.

Niue

Secretariat of the Pacific Community, National Planning and Development Office, Niue. 2008. Niue population profile based on 2006 census of population and housing: a guide for planners and policy-makers.

Occupied Palestinian territories

Palestinian Central Bureau of Statistics. MDGs Indicators Data in Palestine, 1994-2006.

Palestinian Central Bureau of Statistics. 2007. Palestinian Family Health Survey 2006, Final Report, Ramallah-Palestine.

Pakistan

Government of Pakistan Statistics Division. 2007. Pakistan Social and Living Standards Measurement Survey 2006-07, www.statpak.gov.pk.

National Institute of Population Studies (NIPS) [Pakistan], and Macro International Inc. 2008. Pakistan Demographic and Health Survey 2006-07, Islamabad, Pakistan: National Institute of Population Studies and Macro International Inc.

PRSP. 2004. Pakistan: Poverty Reduction Strategy Paper, IMF Country Report No. 04/24.

WHO. (not dated). World Health Survey Result 2003, Report of Pakistan.

Palau

Office of Planning and Statistics Republic of Palau. 2005. 2005 Census of Population and Housing of the Republic of Palau, Volume I: Basic Tables.

Palau Office of Planning and Statistics, UNDP. 2008. Palau, Analysis of the 2005/2006 Household income and expenditure survey, Final report on the estimation of basic needs poverty lines, and the incidence and characteristics of poverty in Palau.

PIREP. 2004. Pacific Regional Energy Assessment, Palau National Report Volume 9, GEF, UNDP, SPREP and the Pacific Islands.

Panama

Direccion de Estadistica Y Censo, Censos de Población y Vivienda de Panamá: Año 2000, http://estadisticas.contraloria.gob.pa/cgi-bin/RpWebEngine.exe/PortalAction?&MODE=MAIN&BASE=LP2000&MAIN=WebServerMain_censos.inl

Papua New Guinea

Gibson, J., and S. Rozelle. 2002. Poverty and Access to Infrastructure in Papua New Guinea, Working Paper No. 02-008.

MDGR. 2004. Papua New Guinea, Millennium Development Goals Progress Report 2004, Government of Papua New Guinea, UNDP.

Paraguay

Direccion General de Estadistica. 2007. Principales Resultados de la Encuesta Permanente de Hogares 2007, Total Pais.

WHO. (not dated). World Health Survey Result 2003, Report of Paraguay.

Peru

INEI. 2006. Casi Dos Millones de Hogares Cocinan Con Lena. Nota de Prensa N°135, Junio 2006.

Instituto Nacional de Estadistica e Informatica, Programa Measure DHS, and ORC Macro. 2007. Peru Encuesta Demográfica y de Salud Familiar, Endes Continua 2004-2006, Informe Principal.

Instituto Nacional de Estadistica e Informatica. 2009. Censos Nacionales 2007: XI de Población y VI de Vivienda, at http://iinei.inei.gob.pe/iinei/RedatamCpv2007.asp?ori=S

World Bank. 2006. Project Appraisal Document on a Proposed Loan in the Amount of US$50.0 Million and a Proposed Grant from the Global Environement Facility Trust Fudn in the Amount of US$10.0 Million to the Republic of Peru for a Rural Electrification Project, Report No.: 32686-PE.

Philippines

MDGR. 2003. Millennium Development Goals Progress Report, Philippines, UNDP.

National Statistics Office (NSO) [Philippines], and ORC Macro. 2004. National Demographic and Health Survey 2003. Calverton, Maryland: NSO and ORC Macro.

National Statistics Office, Republique of the Philippines. Census 2004 at www.census.gov.ph/data/sectordata/2004/pr055410.htm

Philippines Department of Energy. Philippines Energy Plan, 2004-2013

WHO. (not dated). World Health Survey Result 2003, Report of Philippines.

Qatar

MDGR. 2005. The Millennium Development Goals in State of Qatar 2005, The Planning Council General Secretariat.

Rwanda

Institut National de la Statistique du Rwanda (INSR) and ORC Macro. 2006. Rwanda Demographic and Health Survey 2005. Calverton, Maryland, U.S.A.: INSR and ORC Macro.

MDGR. 2003. Millennium Development Goals, Status Report 2003, UNDP.

UNEP. 2006. National Adaptation Programmes of Action to Climate Change, NAPA Rwanda.

PRSP. 2008. Rwanda: Poverty Reduction Strategy Paper, IMF Country Report No. 08/90.

PRSP-Progress Report. 2005. Republic of Rwanda, Poverty Reduction Strategy Annual Progress Report, Policy Matrix.

République du Rwanda, Ministère des Finances et de la Planification Economique. 2005. Impact de la crise de l'énergie sur la croissance économique au Rwanda.

UNCTAD. 2005. Statistical Profiles of the Least Developed Countries, Rwanda.

St Lucia

St Lucia Government Statistics Department. 2001 Population and Housing Census Report.

Samoa

PIREP. 2004. Pacific Regional Energy Assessment, Samoa National Report Volume 11, GEF, UNDP, SPREP and the Pacific Islands.

Samoa Bureau of Statistics. 2008. Samoa Population and Housing Census Report 2006, AusAID.

United Nations. 2006. An Update on the Progress of Implementation of the Brussel Programme of Action by the Government of Samoa.

São Tomé and Principe

Instituto Nacional De Estatística, Sao Tome. 2005. QUIBB 2005 – Dados Preliminares (http://www.ine.st/quadro_resumo_quibb.htm).

MDGR. 2004. République Démocratique de Sao Tomé et Principe, Objectifs du Millénaire pour le Développement, Premier Rapport National.

PRSP. 2008. São Tomé and Príncipe: Poverty Reduction Strategy Paper Progress Report, IMF Country Report No. 08/154.

PRSP-Update. 2005. São Tomé And Príncipe, Update of National Poverty Reduction Strategy, IMF.

World Bank. 2005. International Development Association Country Assistance Strategy For Sao Tome & Principe.

Senegal

Bocar Sada Sy. 2005. Monographie pays Sénégal, élaborée dans le cadre de la politique régionale pour 'l'accroissement de l'accès aux services énergétiques des populations rurales et périurbaines pour atteindre les objectifs du millénaire pour le développement', CEDEAO & UNDP – PREP.

Direction de la prévision et de la statistique. 2004. Rapport de synthèse de la 2ème Enquête Sénégalaise Auprès des Ménages DPS/2004.

ESMAP. 2004. Énergies modernes et réduction de la pauvreté: Un atelier multi-sectoriel. Actes de l'atelier régional, Dakar, Sénégal, du 4 au 6 février 2003, Report 278/04.

MDGR. 2003. République du Sénégal, Suivi des Objectifs du Millénaire pour le Développement, UNDP.

Ndiaye, S. and Ayad. M. 2006. Enquête Démographique et de Santé au Sénégal 2005. Calverton, Maryland, USA : Centre de Recherche pour le Développement Humain [Sénégal] and ORC Macro.

Ndiaye S. and Ayad M. 2007. Enquête Nationale sur le Paludisme au Sénégal 2006. Calverton, Maryland, USA : Centre de Recherche pour le Développement Humain [Sénégal] et Macro International Inc.

PRSP. 2007. Senegal: Poverty Reduction Strategy Paper, IMF Country Report No. 07/316.

PRSP-Progress Report. 2005. Republic of Senegal, Progress Report on Implementation of the Poverty Reduction Strategy, IMF.

WHO. (not dated). World Health Survey Result 2003, Report of Senegal.

Seychelles

Seychelles National Statistics Bureau. 2007. Seychelles in Figures, 2007 Edition.

Sierra Leone

Government of Sierra Leone. 2007. Core Welfare Indicator Survey 2007, Final Statistical Report.

KITE. 2005. Sierra Leone country report for regional policy based on 'increasing access to energy services for populations in rural and sub urban areas in order to achieve the millennium development goals', UNDP-REPP & ECOWAS.

MDGR. 2005. Millennium Development Goals Report for Sierra Leone.

Ministry of Energy & Power. 2006. The Sierra Leone Energy Sector: Prospects & Challenges.

PRSP. 2005. Sierra Leone: Poverty Reduction Strategy Paper: A National Programme for Food Security, Job Creation and Good Governance (2005–2007).

PRSP-Progress Report. 2006. Sierra Leone: Poverty Reduction Strategy Paper, Annual Progress Report.

Statistics Sierra Leone. 2006. Monitoring the Situation of Children and Women: Findings from the Sierra Leone Multiple Indicator Cluster Survey 2005, Preliminary Report, UNICEF.

Statistics Sierra Leone and UNICEF-Sierra Leone. 2007. Sierra Leone Multiple Indicator Cluster Survey 2005, Final Report. Freetown, Sierra Leone: Statistics Sierra Leone and UNICEF-Sierra Leone.

UNECA. 2004. The Energy Policy for Sierra Leone.

Solomon Islands

National Statistics Office (SISO), SPC and Macro International Inc. 2007. Solomon Islands 2006-2007 Demographic and Health Survey.

PIREP. 2004. Pacific Regional Energy Assessment, Solomon Islands National Report Volume 12, GEF, UNDP, SPREP and the Pacific Islands.

SICFCS. 2002. Solomon Islands National Assessment World Summit on Sustainable Development (Rio + 10), Synopsis of Issues, Activities, Needs, and Constraints: Sustainable Development 1992-2002.

Solomon Islands Statistics Office. 2006. Household Income And Expenditure Survey 2005/6 National Report (Part One).

Somalia

COWI. 2003. An Urban Development Programme for the European Commission in Somalia.

UNICEF. 2006. Somalia Multiple Indicator Cluster Survey 2006.

South Africa

Department of Health, Medical Research Council, and ORC Macro. 2007. South Africa Demographic and Health Survey 2003, Pretoria: Department of Health.

Lehohla, P. 2007. Community Survey 2007: Municipal data on household services / Statistics South Africa, Report No. 03-01-22 (2007).

Winkler, H., and A. Marquard. 2007. Energy development and climate change in South Africa: Decarbonising growth in South Africa. Occasional paper 2007/40, for UNDP's Human Development Report 2007/8: Fighting climate change: Human solidarity in a divided world. New York, Human Development Report Office.

WHO. (not dated). World Health Survey Result 2003, Report of South Africa.

Sri Lanka

Department of Census and Statistics, Ministry of Finance and Planning Sri Lanka. 2008. Household Income and Expenditure Survey - 2006/07, Final Report.

Ferdinando, M.M.C.. 2007. Power & Energy, Ministry of Power and Energy Sri Lanka.

MDGR. 2005. Millennium Development Goals, Country Report, Sri Lanka, NCED, UNDP.

PRSP. 2002. Government of Sri Lanka, Regaining Sri Lanka: Vision and Strategy for Accelerated Development.

UNESCAP. (not dated). Country Paper, Sri Lanka.

WHO. (not dated). World Health Survey Result 2003, Report of Sri Lanka.

Sudan

Central Bureau of Statistics, Republic of Sudan. 2007. Sudan Household Health Survey, Summary Finding, Draft.

Department of Statistics, Ministry of Economic and National Planning, Sudan. 1991. Sudan Demographic and Health Survey 1989/1990.

MDGR. 2004. Sudan Millennium Development Goals: Interim Unified Report, UNDP.

Suriname

Bureau voor de Statistiek in Suriname. 2007. Geselecteerde Census variabelen per district (Census-profiel).

MDGR. 2005. Suriname MDG Baseline Report, UNDP.

Swaziland

Central Statistical Office (CSO) [Swaziland], and Macro International Inc. 2008. Swaziland Demographic and Health Survey 2006-07. Mbabane, Swaziland: Central Statistical Office and Macro International Inc.

Swaziland Government. 2004. Annual Report, Energy.

WHO. (not dated). World Health Survey Result 2003, Report of Swaziland.

Syrian Arab Republic

Central Bureau of Statistics, UNICEF. 2007. Findings from the Multiple Indicator Cluster Survey 3 Syrian Arab Republic, 2006, Preliminary Report.

Tanzania

MDGR. 2001. IDT/MDG Progress: International / Millennium Declaration Development Goals.

National Bureau of Statistics (NBS) [Tanzania] and ORC Macro. 2005. Tanzania Demographic and Health Survey 2004-05. Dar es Salaam, Tanzania: National Bureau of Statistics and ORC Macro.

National Bureau of Statistics, United Republic of Tanzania. 2007. Tanzania in Figures 2006.

PRSP. 2005. The United Republic of Tanzania National Strategy for Growth And Reduction Of Poverty (NSGRP), IMF.

Tanzania Commission for AIDS (TACAIDS), Zanzibar AIDS Commission (ZAC), National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS), and Macro International Inc. 2008. Tanzania HIV/AIDS and Malaria Indicator Survey 2007-08. Dar es Salaam, Tanzania: TACAIDS, ZAC, NBS, OCGS, and Macro International Inc.

Tanzania Electric Supply Company Limited. 2007. Tanzania Energy Development and Access Project, Part B, Environmental and Social Management Framework for the Off-Grid Electrification Component.

Thailand

Limmeechokchai, B., and S. Chawana. 2004. How to Succeed in the Adoption of the Improved Cooking Stove: The Case Study of Thailand, The Joint International Conference on 'Sustainable Energy and Environment (SEE)' 1-3 December 2004, Hua Hin, Thailand.

MDGR. 2004. Thailand Millennium Development Goals Report 2004, Office of the National Economic and Social Development Board, United Nations Country Team in Thailand.

Shrestha, R.M, et al. (not dated). Institutional reforms and electricity access: lessons from Bangladesh and Thailand.

Thailand National Statistical Office. 2006. Thailand Multiple Indicator Cluster Survey, December 2005–February 2006, Final Report. Bangkok, Thailand: National Statistical Office.

Timor-Leste

ADB. 2004. Power Sector Development Plan For Timor-Leste.

MDGR. 2004. Timor-Leste, Millennium Development Goals Report, UNDP.

PRSP. 2005. Democratic Republic of Timor-Leste: Poverty Reduction Strategy Paper—National Development Plan, Road Map for Implementation of National Development Plan, Overview of Sector Investment Programs—Strategies and Priorities for the Medium Term, IMF Country Report No. 05/247.

UNDP. 2006. Timor-Leste Human Development Report 2006, The Path out of Poverty, Integrated rural development.

World Bank. 2007. Project Paper on a Proposed Grant in the Amount of Sdr 1.64 Million to the Democratic Republic of Timor-Leste for an Energy Services Delivery Project.

Togo

Direction Generale de la Statistique et de la Comptabilité Nationale. 2007. Suivi de la Situation des Enfants et des Femmes, Résultats de l'enquête nationale à indicateurs multiples Togo 2006, Rapport Final, UNICEF.

ENDA. 2005. Monographie pays Togo, élaborée dans le cadre de la politique régionale pour 'L'accroissement de l'accès aux services énergétiques des populations rurales et périurbaines pour atteindre les objectifs du millénaire pour le développement', CEDEAO & UNDP – PREP.

MDGR. 2003. Suivi des Objectifs du Millénaire pour le Développement au Togo, Premier rapport, UNDP.

PRSP. 2008. Togo: Interim Poverty Reduction Strategy Paper, IMF Country Report No. 08/144.

UNDP. 2007. Le Togo se mobilise autour des OMD, Stratégie National de Développement à Long Terme basée sur les OMD.

Tokelau

Statistics New Zealand and the Office of the Council for the Ongoing Government of Tokelau. 2006. Tokelau Census of Population and Dwellings, 2006 Census, Tabular Report.

Tonga

PIREP. 2004. Pacific Regional Energy Assessment, Tonga National Report Volume 14, GEF, UNDP, SPREP and the Pacific Islands.

Tonga Statistics Department. 2008. Tonga 2006 Census of population and housing, Volume 1: Administrative Report and Basic Tables.

Trinidad and Tobago

The Government of the Republic of Trinidad and Tobago, Ministry of Social Development, Central Statistical Office, UNICEF. 2008. Monitoring the situation of children and women, Multiple Indicator Cluster Survey 3.

Tunisia

Ben Arfa O.. 2008. La STEG et ses Perspectives de Développement.

MDGR. 2004. Tunisie, Rapport National sur les Objectifs du Millénaire pour le Développement, Nations Unies.

Ministère de la Santé Publique [Tunisie], Office National de la Famille et de la Population, UNICEF. 2008. Enquête sur la Santé et le Bien-être de la Mère et l'Enfant, MICS3.

Ounalli A.. 2006. Rural Electrification Institutional Experience: Case of Tunisia, Energy Week at the World Bank, 6-9 March 2006,

UNDP, World Bank. 2005. Rural Electrification in Tunisia: National Commitment, Efficient Implementation and Sound Finances.

WHO. (not dated). World Health Survey Result 2003, Report of Tunisia.

Turkey

Hacettepe University Institute of Population Studies. 2004. Turkey Demographic and Health Survey 2003.

Tuvalu

PIREP. 2004. Pacific Regional Energy Assessment, Tuvalu National Report Volume 15, GEF, UNDP, SPREP and the Pacific Islands.

SPC. 2005. Tuvalu 2002, Population and Housing Census, Volume 1 Analytical Report.

Tuvalu Government Ministry of Finance, Economic Planning & Industries. 2006. Household Income and Expenditure Survey (HIES) 2004/2005, Final Report.

Uganda

Sengendo, M. et al. 2005. Gender, Poverty and Energy in Implementing Sustainable Development in Uganda, National Paper Uganda.

MDGR. 2003. The Millennium Development Goals, Progress Report for Uganda.

Ministry of Energy and Mineral Development, Republic of Uganda. 2002. The Energy Policy for Uganda..

Ministry of Energy and Mineral Development, The Government of the Republic of Uganda. 2001. Rural Electrification Strategy and Plan Covering the Period 2001 to 2010.

Ministry of Energy and Mineral Development, Republic of Uganda. 2007. The Renewable Energy Policy for Uganda.

PRSP. 2004. Poverty Eradication Action Plan (2004/5-2007/8), IMF.

Uganda, Republic of. 2001. National Biomass Energy Demand Strategy 2001 – 2010, Draft Document, Ministry of Energy and Mineral Development.

Uganda Bureau of Statistics (UBOS) and Macro International Inc. 2007. Uganda Demographic and Health Survey 2006. Calverton, Maryland, USA: UBOS and Macro International Inc.

United Arab Emirates

WHO. (not dated). World Health Survey Result 2003, Report of United Arab Emirates.

Uruguay

WHO. (not dated). World Health Survey Result 2003, Report of Uruguay.

Instituto Nacional de Estadistica Uruguay. Encuesta Nacional de Hogares Ampliada 2006, Flash Tematico 7.

Vanuatu

PIREP. 2004. Pacific Regional Energy Assessment, Vanuatu National Report Volume 16, GEF, UNDP, SPREP and the Pacific Islands.

Ministry of Health, Government of Vanuatu. 2008. Vanuatu Multiple Indicator Cluster Survey 2007, Final Report, Port Vila, Vanuatu.

Vanuatu National Statistics Office. 2008. Analysis of the 2006 Household Income and Expenditure Survey, A Report on the Estimation of Basic Needs Poverty Lines and the Incidence and Characteristics of Poverty in Vanuatu, ADB, UNDP.

Viet Nam

Committee for Population, Family and Children [Viet Nam], and ORC Macro. 2003. Viet Nam Demographic and Health Survey 2002. Calverton, Maryland, USA: Committee for Population, Family and Children and ORC Macro.

General Statistics Office of Viet Nam. 2007. Viet Nam Multiple Indicator Cluster Survey 2006 - MICS3.

MDGR. 2005. Viet Nam achieving the Millennium Development Goals.

PRSP. 2006. Viet Nam: Poverty Reduction Strategy Paper—Annual Progress Report, IMF Country Report No. 06/340.

Vu Van Thai. 2006. Workshop on Mean streaming Policies and Investment in Low Carbon: Opportunity for New Approaches to Investment and Flexible Mechanisms, 30-31 August 2006, UNESCAP, Bangkok, Thailand, Viet Nam Energy Policy: Energy Investment and Climate Change.

WHO. (not dated). World Health Survey Result 2003, Report of Viet Nam.

Yemen

ESMAP. 2005. Household Energy Supply and Use in Yemen: Volume I, Main Report.

MDGR. 2003. Millennium Development Goals, Progress Report for Yemen, UNDP.

Ministry of Health and Population, UNICEF 2008, Yemen Multiple Indicator Cluster Survey 2006, Final Report

PRSP. 2002. Republic of Yemen, Poverty Reduction Strategy Paper, 2003–2005, IMF

Central Statistical Organization, Yemen. Census 2004.

Zambia

Central Statistical Office [Zambia], Central Board of Health [Zambia], and ORC Macro. 2003. Zambia Demographic and Health Survey 2001-2002. Calverton, Maryland, USA: Central Statistical Office, Central Board of Health, and ORC Macro.

PRSP. 2002. Republic of Zambia, Poverty Reduction Strategy Paper.

PRSP-Progress Report. 2004. Republic of Zambia, Second PRSP Implementation Progress Report July 2003 – June 2004, IMF.

Republic of Zambia. 2006. Fifth National Development Plan 2006-2010, PRSP.

Sibanda, N. 2006. Reporting on Energy Issues in Zambia, 14th Session of the UN Commission on Sustainable Development (CSD 14), UN Headquarters, New York. May 9, 2006.

UNDP. 2006. Economic policies for Growth, Employment and Poverty Reduction, Case Study of Zambia.

WHO. (not dated). World Health Survey Result 2003, Report of Zambia.

Central Statistical Office (CSO), Ministry of Health (MOH), Tropical Diseases Research Centre (TDRC), University of Zambia, and Macro International Inc. 2009. Zambia Demographic and Health Survey 2007. Calverton, Maryland, USA: CSO and Macro International Inc.

Zimbabwe

Central Statistical Office (CSO) [Zimbabwe] and Macro International Inc. 2007. Zimbabwe Demographic and Health Survey 2005-06. Calverton, Maryland: CSO and Macro International Inc.

Government of Zimbabwe. 2007. Draft Energy Policy.

WHO. (not dated). World Health Survey Result 2003, Report of Zimbabwe.

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