

# Bioenergy: The Achilles heel of renewable energy statistics

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## KEY MESSAGES:

- Globally, bioenergy is by far the largest source of renewable energy used today, but the majority of bioenergy statistics are estimates rather than measured observations.
- Traditional biomass use may be significantly over-stated due to the relatively simple methodologies commonly used to estimate consumption in developing countries. However, industrial uses in those same countries may also be under-estimated by a similar amount due to a lack of data.
- IRENA has focused on improving biogas data over the last year and has expanded its database to include 30 countries that were not previously covered in international energy statistics. From this data, it is estimated that over 130 million people may currently be using biogas as a clean cooking fuel.
- Bioenergy statistics can be improved by combining small surveys of household energy use with the results of large-scale household surveys to produce nationally representative estimates of residential solid biofuel consumption. IRENA is working with FAO to pilot such studies in a number of countries.
- A large part of industrial bioenergy consumption can be measured by focusing on a few industries in the forestry and agricultural processing sectors. If data are not available, then estimates can be produced by applying energy conversion factors to the outputs of those industries. Examples of how to do this are given in IRENA's statistics training materials (available online).

## The importance of bioenergy data for global renewable energy statistics

Recent years have seen a dramatic increase in the use of renewable energy for electricity generation. Driven by falling costs and supportive policies, wind and solar energy have expanded rapidly in many parts of the World, so that renewables now account for about one-fifth of all electricity generation. However, despite these developments, bioenergy still accounts for about 70% of renewable energy supply and consumption.

While renewable energy statistics are improving in most countries, there are still many problems with the collection and reporting of bioenergy data, especially in non-OECD countries. These countries account for a significant share of global bioenergy consumption, so uncertainties about their use of bioenergy has an impact on renewable energy statistics at the global level.

## So-called "traditional" biomass use

Many non-OECD countries do not collect statistics about the use of primary solid biofuels, so most agencies reporting global energy statistics estimate consumption in some way.

For residential consumption, one of the most common estimation techniques is to multiply population by a constant level of consumption per capita (derived from whatever information was available for a country at some time in the past).

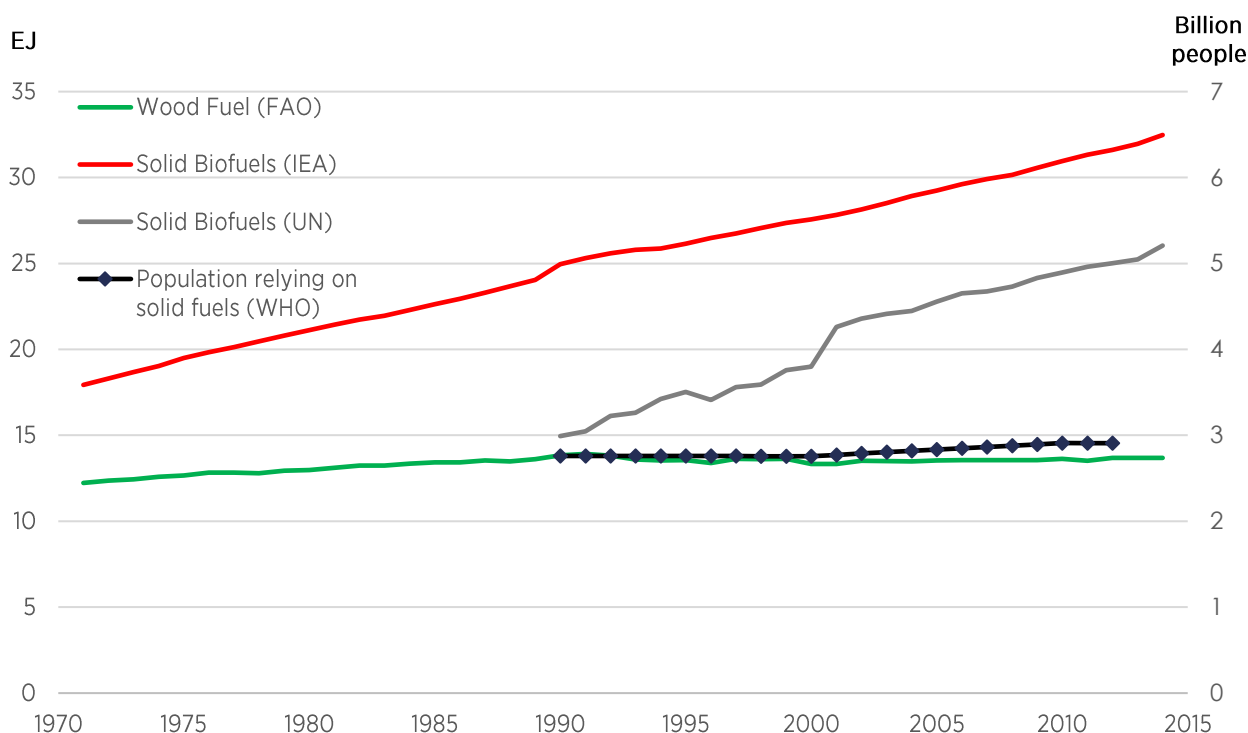
The one exception to this is the UN Food and Agriculture Organization (FAO), which stopped using this method to estimate wood fuel consumption in 2000. Since 2000, FAO has produced wood fuel estimates using a model that takes into account both population growth and other factors such as urbanisation, income per capita and forest cover. This

model has resulted in a much flatter trend in estimated wood fuel consumption since 2000.

The differences in so-called "traditional" biomass use reported by IEA, the UN Statistics Division (UNSD) and FAO are shown in the figure below. The trend for FAO only includes wood fuel (fuelwood and the wood used to make charcoal), so it is lower than the other two lines. However, the main problem revealed by a comparison of these estimates is the different slopes of the three lines.

By largely estimating biomass use as population multiplied by a fixed per capita consumption level, the IEA and UNSD datasets show a continuously increasing trend in consumption that is mostly a reflection of population growth and this results in a huge difference in recent years compared to the FAO estimates.

## Trends in "traditional" bioenergy consumption 1970 - 2015



Note: the wood and solid biofuel consumption figures are for residential consumption in non-OECD countries, shown on left scale in EJ. Reliance is based on WHO figures (global % reliant on solid fuels) multiplied by global population, measured in billions on right scale.

There is some evidence to suggest that traditional biomass use has not expanded in line with population. For example, the figure above also shows census data collated by the World Health Organization (WHO) for the number of people relying on solid fuels for cooking.

The WHO data shows that the number of people using solid fuels has increased only slightly since 1990 and multiplying those figures by constant per capita consumption would result in a consumption trend that is closer to the FAO estimates.

### Non-residential biomass use

While residential consumption of solid biofuels may be over-estimated, the opposite is likely for non-residential consumption. Statistics about non-residential biomass use are also unavailable for many countries but, in this case, very few estimates are made to fill these gaps.

At present, global energy statistics report industrial use of solid biomass in non-OECD countries as about 13% of their bioenergy consumption. The majority of this is found in a few countries in Asia and South America where there is production of combined heat and power from bagasse and black liquor in the sugar processing and wood pulp industries. The reported use of solid biomass purely for process heat or in the commercial and public services sectors is negligible.

In many countries, a significant amount of solid biomass is used for energy in activities such as wood and food processing, bakeries, restaurants and public

This uncertainty about the real trend in traditional biomass consumption is important for the calculation of renewable energy as a share of final energy consumption, which is an SDG Energy indicator.

At present, the SDG indicator shows this share increasing from 17.5% in 2000 to 18.3% in 2014, but if traditional biomass use has really not increased by much since 2000, the share would not have increased but actually fallen to 16.8% in 2014.

buildings, but most of this consumption is currently missing from global energy statistics.

For example, FAO's analysis of wood energy use suggested that consumption in commerce and public services amounted to an additional 17% on top of residential consumption on average. Although this was based on a relatively small number of studies that have measured both residential and non-residential biomass use, it does suggest that the latter could be significant.

In addition, the use of biomass for drying forest products and estate crops (e.g. tea, coffee, tobacco) and for process steam in agro-industry (e.g. oil palm processing) may also be substantial. Based on their production levels and the energy required to process each tonne of these products, these uses alone could amount to as much as 15-20 EJ of bioenergy. This is only partly recorded at present, but IRENA is working with countries to try and improve this data.

## Biogas

The use of biogas for heat and power has rapidly expanded for many years now in Europe and North America, but is also starting to grow in many other countries as well.

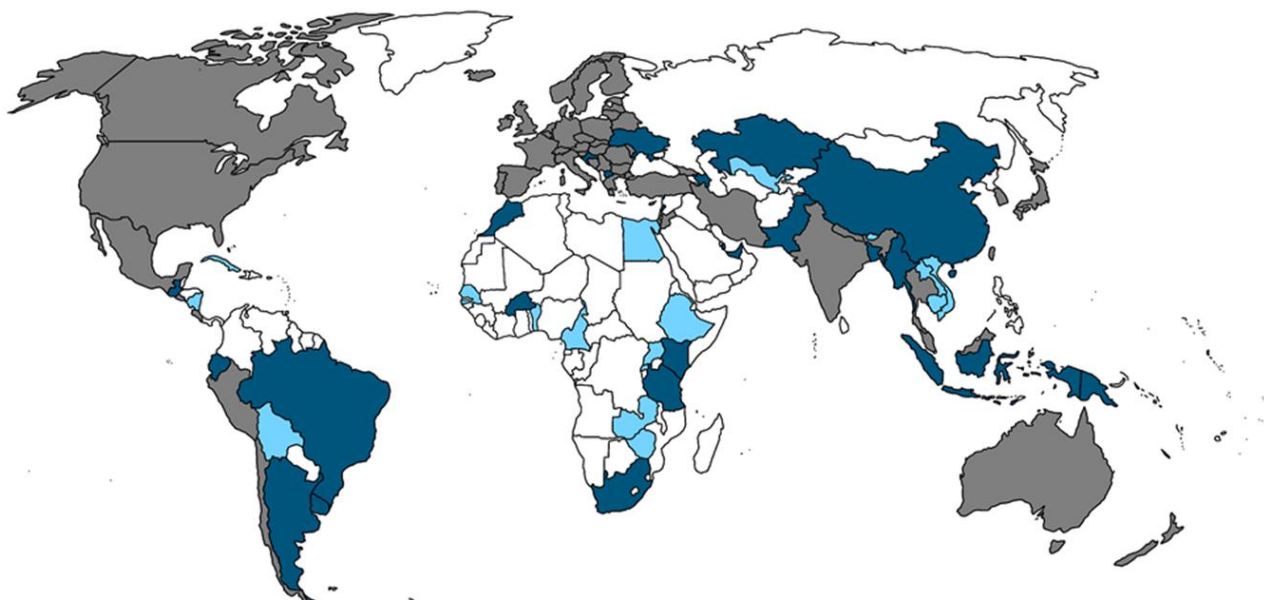
Much of this production is not captured in global statistics. For example, IRENA's electricity statistics report biogas electricity production in about 25 countries that are not currently included in other international datasets. The generating capacity in these countries is about 350MW (or about 25% of non-OECD biogas generating capacity) and much of this has appeared in the last five years.

About 20 countries also have programmes to expand the use of biogas for cooking, but are currently

reported as having no biogas production. This includes some countries that have built tens of thousands of household biogas plants in recent decades with the support of national biogas programmes.

Improving information about biogas can also highlight achievements in clean energy access. One of the SDG Energy indicators is the proportion of the population using clean (cooking) fuels and technologies, which include biogas as one of the more affordable clean cooking options. Based on the reported achievements of national biogas programmes, IRENA estimates that over 135 million people may currently be using biogas for cooking, with the majority of these people living in Asia.

### Countries currently included in global biogas statistics



*Biogas production is reported by IRENA, IEA and UNSD in countries shaded in grey. IRENA statistics also include biogas production in countries shaded in blue (dark blue = biogas and electricity from biogas; light blue = biogas only).*

### Improving bioenergy statistics

Considering the magnitude of bioenergy consumption, the current lack of reliable statistics should be addressed and three approaches are suggested.

**Household surveys.** National censuses and large-scale household surveys already collect data about fuels used for cooking, but do not go beyond recording how many households use different fuels. Relatively small surveys can measure the quantities of biofuels used per capita, which can then be combined with household survey results to produce nationally representative consumption estimates. IRENA is currently working with FAO to pilot such studies in a number of countries and produce a household survey module that can be applied at minimal cost.

**Industrial uses.** As noted above, some industries are almost certainly using biofuels and these should be the

focus of attention for collecting bioenergy statistics. Even if data is unavailable, then energy use can be estimated from their output using simple conversion factors (e.g. the heat and power required for sugar cane processing). IRENA has produced a number of examples of how to apply such conversion factors, which are available in IRENA's online training materials.

**Inter-sectoral co-ordination.** Most bioenergy is produced and consumed outside the energy sector. Thus, efficient data collection will require a co-ordinated approach. In particular, agencies responsible for natural resource management may be able to provide assistance with data and expertise that will be useful for measuring or estimating bioenergy use in a country. IRENA is also able to provide technical advice to countries to help them improve their statistics.

