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Energy poverty: An overview

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ABSTRACT

In the coming decades the energy sector will have to face three major transformations concerned with climate change, security of supply and energy poverty. The first two have been extensively analysed, but less attention has been paid to the third, even though it has a great influence on the lives of millions of people. This paper presents an overview on energy poverty, different ways of measuring it and its implications. According to the WHO, indoor pollution causes an estimated 1.3 million deaths per annum in low income countries associated with the use of biomass in inadequate cookstoves. Although energy poverty cannot be delinked from the broader, more complex problem of poverty in general, access to energy infrastructures would avoid its most serious consequences and would help to encourage autonomous development. According to the IEA, the cost of providing universal access to energy by 2030 would require annual investment of $35 billion, i.e. much less than the amount provided annually in subsidies to fossil fuels. Finally, the paper argues that energy and energy poverty need to be incorporated into the design of development strategies.

Contents

1. Introduction

In the coming decades the energy sector will have to face three major transformations, concerned with energy security, climate change and energy poverty. The first two have been extensively analysed (see [16,4,18]), but less attention has been paid to the third in terms of both research and its inclusion on political agendas [6]. The UN's Millennium Development Goals [32] – whose objective is to eradicate extreme poverty, improve living conditions and facilitate progress towards sustainable development – do not include any mention of access to energy. Nor qhas this issue been mentioned to date (see [28]) in the context of the United Nations Framework Convention on Climate Change (UNFCCC).

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Table 1
Energy and development indicators, 2010.
Source: World Bank [41].

	HDI	Life expectancy (years)	GDP per capita ($, PPC)	Electricity consumption per capita (kW h)	Energy consumption per capita (tep)	Passenger cars (per 1000 people)	CO_2 per capita (t)
United States	0.92	78.2	46.612	13.394	7.1	632	19.7
Germany	0.92	80	37.652	7.215	4.0	510	9.8
Saudí Arabia	0.78	73.9	22.747	7.967	6.1	139	16.5
Russia	0.78	68.8	19.940	6.452	4.9	233	11.3
Brazil	0.73	73.1	11.180	2.384	1.3	178	1.9
China	0.69	73.3	7.553	2.944	1.8	35	4.4
India	0.55	65.1	3.366	616	0.5	12	1.2
Nigeria	0.47	51.4	2.367	137	0.7	31	0.7
Ethiopia	0.39	58.7	1.033	54	0.4	1	0.1

This paper seeks to provide an overview of the energy-related aspects of poverty, a concept which has come to be known as "energy poverty" (see [14]). There are many different views to be found in the existing literature, but here the problem is approached in a way that at least enables the most significant elements of it to be identified. We analyse the current situation as regards energy poverty, its future prospects and its current impacts. Although energy poverty affects many different economic sectors and hampers environmental protection efforts, its most relevant (and perhaps least known) repercussion is its impact on health: according to the WHO it currently causes more deaths than malaria or tuberculosis. The paper ends with an analysis of the possibilities of providing universal access to energy.

Although it is difficult to separate energy poverty from the broader, more complex problem of poverty in general, this article do not seek to examine the underlying causes and consequences of poverty. Nor is the paper intended to analyse the various technological options available for providing access to energy or indeed to assess ongoing projects [40]. The attention is focused rather on poor[1] countries, and particularly on energy poverty in the sense of a lack of access to energy. The particular features displayed by energy poverty in wealthier countries ("fuel poverty", see [15]) therefore lie outside the scope of the study.

The paper is organised as follows: Section 2 examines the link between energy consumption and economic development. Section 3 defines the concept of energy poverty and outlines the various ways in which it is measured. Section 4 analyses the current situation and trend as regards energy poverty. Section 5 then looks at the impacts of energy poverty on health, the economy and the environment, and Section 6 analyses the cost of providing universal access to energy. Section 7 concludes.

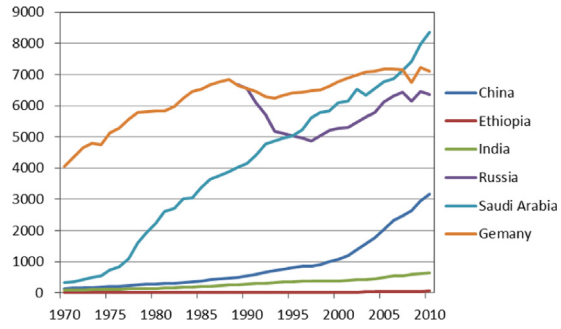

Fig. 1. Electricity consumption, 1960–2010, kW h per capita. .
Source: World Bank [41]

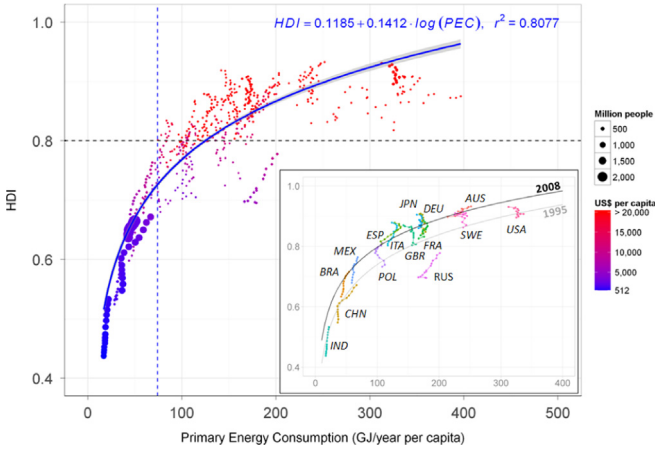

Fig. 2. Human development index and energy consumption, 1995–2008.
Notes:

(1) HDI: human development index; PEC: primary energy consumption.
(2) AUS: Australia; BRA: Brazil; CHN: China; DEU: Germany; ESP: Spain; FRA: France; GBR: United Kingdom; IND: India; ITA: Italy; JPN: Japan; MEX: Mexico; POL: Poland; RUS: Russia; SWE: Sweden; USA: United States of America.
(3) The vertical blue dotted line represents the threshold of the minimum energy to achieve a HDI > 0.8 for the set of countries and years analysed (i.e. Malta 2000, with PEC of 74 GJ/cap and HDI of 0.801). Countries above the horizontal line are classified as developed countries (i.e. HDI > 0.8), otherwise they are considered as developing countries.
(4) GDP per capita in US$, constant prices of 2008.

Source: Arto et al. [2]. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

2. Energy and development

Energy consumption and economic development are closely linked (see for example, [20] or [9]). The basic macro-economic indicators of a country generally include energy and electricity consumption, number of vehicles and, lately, per capita CO_2 emissions. Table 1 shows indicators related to development and energy for nine representative countries. Observe that the human development index (HDI), life expectancy at birth and gross domestic product (GDP) per capita are all closely related to energy consumption. For instance, Germany and the USA, which have very similar HDI scores (0.92) and life expectancy levels (80 and 78 years, respectively), also have high per capita energy consumption levels (in excess of 4 t of oil equivalent (toe) per person per annum). By contrast, India, Nigeria and Ethiopia, whose HDI scores (0.55, 0.47 and 0.39, respectively) and life expectancy (below 65

[1] The UN distinguishes between less economically developed countries (LEDCs) and more economically developed countries (MEDCs). We use "poor countries" to refer to LEDCs countries.