Energy Policy 37 (2009) 237–245

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Development challenges under the Clean Development Mechanism (CDM)—Can renewable energy initiatives be put in place before peak oil?

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ARTICLE INFO

Article history:
Received 28 May 2008
Accepted 19 August 2008
Available online 15 October 2008

Keywords:
Clean Development Mechanism (CDM)
Sustainable development
Renewable energy

ABSTRACT

The "Sustainable Development" aspect of the Clean Development Mechanism (CDM) under the Kyoto Protocol is examined, with regard to its current impact on crucial developmental issues.

The paper discusses the immediate and urgent global concerns of developmental needs, energy and climate change, whilst highlighting their influence on the poor in the developing world. The global responses to address the above concerns in terms of renewable energy technologies, policies and strategies that can be instrumental in addressing the issues are discussed, with main emphasis on the CDM under the Kyoto Protocol. The critical issue of whether the CDM can address poverty alleviation and sustainable development in developing countries is discussed in the context of existing market principles, transparency of the mechanism, economics and the daunting bureaucratic procedures involved.

The paper concludes that the CDM, if suitably modified, can go some way to address sustainable development and alleviate poverty for poor rural areas and not increase emissions by a focus on renewable energy technologies. This result can be achieved as the energy consumption of rural sectors is currently so small relative to developed economies that only small additional renewable energy generation capacities are needed to make a measurable difference.

1. Global concerns—Urgent and immediate

The need for more and more energy across the globe to fuel economic development has resulted in an exponential growth in usage of fossil fuels since the industrial revolution. This unsustainable drawdown on finite resources is now coming to a head, as resource limits are being reached and the inevitable gap between demand and supply is poised to generate multiple challenges to our modern way of living. These challenges will affect every aspect of civilisation, including transport, resource use, food production, water supply, our lifestyle and the environment. The major global environmental problem caused by this unrestrained growth, is anthropogenic climate change (which is now universally accepted by the scientific community to be due to the addition of large quantities of anthropogenic emissions (CO_2 and other greenhouse gases (GHGs)) into the atmosphere.

The strain on the world economy is beginning to show not only in terms of ever increasing oil and gas prices but the cost of funding these increases are leaking over to the housing market in rich countries causing global financial uncertainty and to the global food supply in poor countries, as high oil prices lead to high grain prices.

Along with the rest of the world, developing and least developed countries face an uncertain energy supply future. But for poor countries this energy future is predicated by a fine balance between growing sufficient food to feed the population and having the funds to import, if local production is not sufficient. While no one can predict how high oil prices will move in the coming years, signs seem to indicate that they will rise until sufficient demand destruction occurs. In general, it is the developing countries that are at most risk, as many of these countries are heavily dependent on imported oil supplies for power generation as well as transport links with the rest of the world.

It is highly likely that the world has exceeded existing resource limits whereby, the consumptive demands of both the rich and the poor collectively exceed the capacity of the global ecosystem to provide. Nevertheless there is some chance that a reallocation of resources and an urgent movement towards renewable energy supply in the poorer countries can bridge the gap between a clearly unsustainable situation and some form of steady-state ecologically manageable equilibrium. We will argue that such a reallocation is more likely to achieve results among the rural poor because they currently use such a small proportion of the world's fossil fuel resources.

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doi:10.1016/j.enpol.2008.08.019

1.1. The developmental concern

As one of many other contemporary issues, sustainable development envisages an argument for the present and future sustenance of mankind and is defined by the Brundtland Commission as: "To meet the needs of the present without compromising the ability of future generations to meet their own needs" (Bruntland, 1987). However, Daly and Townsend (1993) argue strongly against the Bruntland report because it allows for growth of the world economy by a factor of between five and 10 and this level of growth they suggest is impossible, due to resource constraints alone, without even considering the climate change aspect.

Several other authors also suggest that economic growth is the problem and in "Limits to Growth", Meadows et al. (1972) observed over 35 years ago that growth, if continued unabated, must lead to systemic collapse. The recent 30-year update of this series of the Club of Rome reports reinforced the conclusion that present production and consumption patterns are unsustainable. The later report also suggested in hindsight that the past 30 years had been a lost opportunity for changing the way we organise society (Meadows et al., 2004). This conclusion echoes the one made by Catton in his book on "Overshoot" (Catton, 1980). Of immediate interest is the fact that the above authors no longer believe that the concept "sustainable development" is useful and that "survivable development" may be a more appropriate concept today. Catton (1980) in particular suggests that our goal should be to come up with ways to manage the collapse of civilisation so that it does not degenerate into savagery as happened on Easter Island in the 17th century.

In recent years, sustainable development has become a buzz word extraordinaire; suggesting that the rich can maintain advanced lifestyles and the poor can emulate the same, if only we make minor adjustments to appease the environment. The bottom line, however, is that our effect on the environment is underpinned by our resource use per population multiplied by the population and the critical resource in this bottom line is energy.

1.2. The energy concern

With the price of oil in 2008 increasing by a factor of 10 over the last decade, the issue of an affordable and secure energy supply has been dominating policy agendas across the world. Arguments are raging over the timing of an inevitable peak in world oil production, with pessimists suggesting either it has already occurred (Deffeyes, 2005) or it will within a few years (Campbell, 2003). The range suggested by the optimists varies considerable from between 10 and 40 years into the future (Dorian et al., 2006). But it is becoming obvious that the optimists including the IEA are coming to the conclusion that it will probably be sooner rather than later (IEA, 2007).

Coal, the primary fossil resource, which started the industrial revolution, is documented to be the most abundant of the conventional fossil fuels. Conventional thinking, relying on decades old coal resource estimates; suggest that this resource will last for the next 150 years at the current rates of production (Heinberg, 2008). Unfortunately, such predictions may be too optimistic observing the rampant coal consumption trends in emerging economies in Asia (China and India). With China poised to surpass the US as world's largest economy in 2020 (or earlier) and India following the trend to be in third place, both China and India together are estimated to account for 72% of the projected increase in world coal consumption from 120 billion GJ in 2004 to 210 billion GJ in 2030 (EIA, 2007a; EWG, 2007).

Adding to the above concerns, it is also estimated that the peak world production of natural gas may soon follow that of oil. This conclusion is substantiated by the fact that North America (the most exhaustive consumer of natural gas), as well as Russia and Europe already are facing severe supply constraints (Bliss, 2005). The demand for natural gas worldwide paradoxically is suggested to rise from 100 trillion cubic feet in 2004 to 163 trillion cubic feet by 2030 (EIA, 2007b).

Nuclear energy too suffers from resource constraints with around 2.3 million tonnes of uranium already mined and only around 1 million tonnes (based on reasonably assured resources) in the ground and recoverable at a cost up to $130/kg. At current rates of consumption this resource would last around 70 years but if the world decides to increase the number of reactors this resource would go down substantially (EWG, 2006). Clearly the nuclear option is not viable in the long term as a secure source of world energy.

As fate would have it, just as many developing countries are set to make the transition from agricultural societies to industrial societies, peak oil is upon us, threatening to take away the fuel needed for that transition. It has been estimated (IEA, 2007) that the global primary energy demand will increase by 1.6% per year from 2004 to 2030, growing from 11.2 to 17.1 billion tonnes of oil equivalent (Btoe)/annum by 2030; a cumulative increase of more than 50%. About 70% of this projected new energy demand will be to cater to requirements of developing nations in Asia alone (Wood et al., 2007). Importantly, however, such "growth as usual" scenarios do not take into account disruptions due to climate change or resource constraints (peak oil). In the short term, highly volatile changes in prices of fossil fuels, particularly oil and gas are likely. A considerable literature is appearing, which examines the relationship between the world economy and the price of oil (IEA, 2004; Dorian et al., 2006; The Authors, 2006; Lloyd, 2007).

1.3. The population concern and inequality

The ever growing world population (approximately at the rate of 100 million/year), and currently (2008) around 6.8 billion is predicted by some to overshoot the 10 billion mark in 2050, before stabilising around 12 billion (Yoshihisa, 2007). Most of the expected increase in population is projected to take place in the less developed regions of the world, while the population of the more developed regions are predicted to remain mostly stagnant; that is without taking immigration into account (UNDESA, 2007).

Most observers investigating the carrying capacity of the earth, however, suggest that these projected figures are well in excess of the available resources to sustain the population at any level of energy use in excess basic necessities. Currently, energy consumption per capita varies greatly according to level of development, from around 500 W in developing countries to as high as 11.4 kW in the US (WRI, 2006). One consequence of the unequal resource distribution is that today almost 1.6 billion people in developing countries and emerging economies (about one-quarter of the world's population), do not have access to electricity. At present, some 2.5 billion people in the world directly depend on traditional biomass fuels and in-efficient technologies for cooking and heating.

1.4. The climate concern

In addition to global energy concerns, there is a widespread consensus, backed by comprehensive scientific and technical evidence that global climate change is caused by persistent accumulation of atmospheric green house gases (GHGs), which is in turn due to mankind's ever expanding economic activity.