Fuel Complementation Rather than Substitution

It is widely assumed that increased penetration of modern fuels in developing countries implies a process of fuel transition (or fuel shift or fuel substitution), away from traditional fuels and towards modern fuels. A related assumption is that such a shift depends on per capita GNP, and further assumptions are that this fuel shift can and should be promoted by development efforts.

These assumptions derive support from the way changes in fuel mix are usually represented, i.e. as shares of traditional fuels in overall energy consumption, rather than in absolute quantities. For instance, the World Bank correlates the share of biomass energy per capita with GNP per capita for 80 countries, which clearly shows a declining trend (Figure 1). In these types of analyses, biomass energy is considered a traditional fuel which 'helps trap the user in poverty' (World Bank, 1996). It is then concluded that rising per capita GNP causes a shift away from traditional fuels towards modern fuels. The conclusion is usually supported by selected case studies from urban areas.

Taking a closer look, we find that these assumptions and this conclusion cannot be validated for the vast majority of the world's traditional energy users, who happen to live in South and South-east Asia (including China). There appears to be no inverse correlation whatsoever between consumption of biomass fuel per capita and per capita GNP for the 16 RWEDP member-countries countries (Figure 2).

Historical analyses by country also contradict the hypothesis of a fuel shift. For instance, in Thailand over the period 1980–96 when per capita GNP almost trebled, biomass energy consumption per capita increased by 68% (Fig. 3, Thailand Department of Energy Development and Promotion). In Indonesia, over the period 1986 to 1994, when GNP per capita increased by 46%, per capita biomass energy consumption increased by 7%. In Nepal, between 1981 and 1995, when per capita GNP increased by 28%, biomass energy consumption per capita fluctuated by about 2%.

Overall in Asia, biomass energy consumption per capita has been, and still is, increasing. On top of the increased per capita consumption comes, of course, an increase due to rising population.It is further noticed that in 1987, per capita GNP in North America was 40 times larger than in South and South-east Asia, but biomass consumption per capita was the same in both subcontinents (Hall, 1997). More recent data (1993) confirm this picture, and it is noted that more than one third of the biomass energy in the USA is consumed in the residential sector (IEA).

Figure 1: The use of biomass in relation to GNP in 80 countries (WB96)

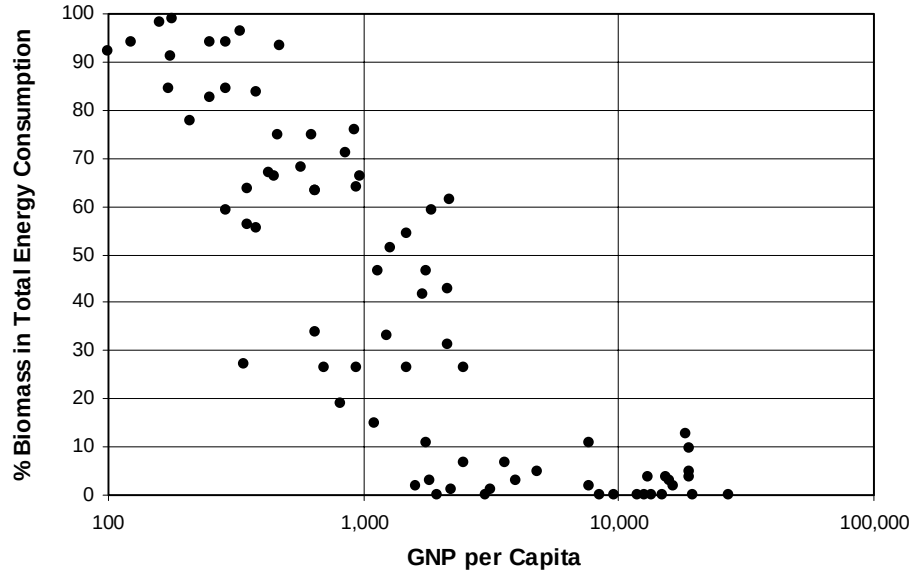
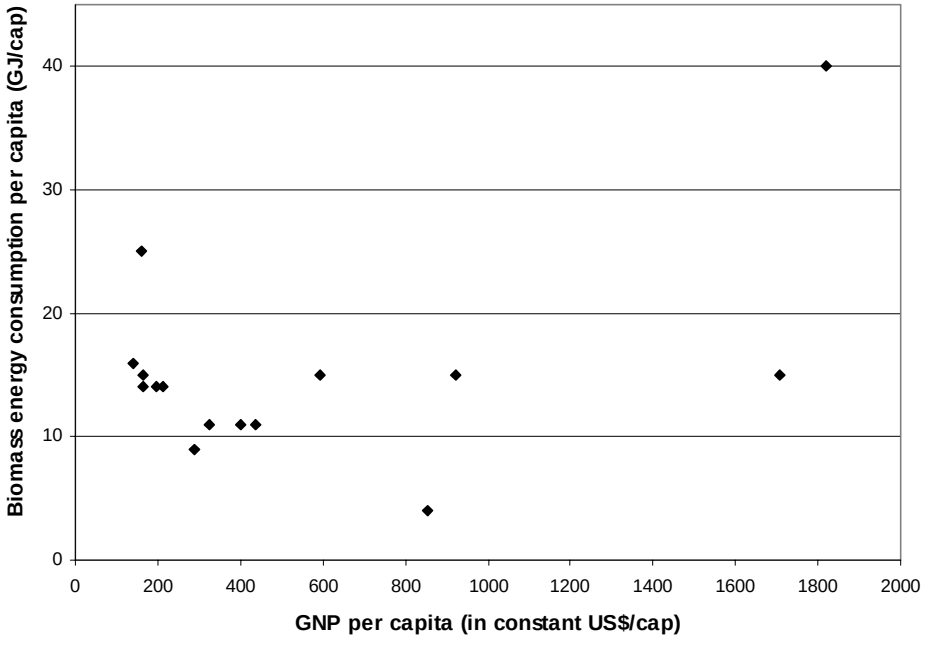


Figure 2: Biomass energy consumption/cap vs per capita GNP in 1987 for 16 countries in Asia



These important facts remain hidden when we look at the share of biomass fuels in total energy consumption. Also, it is not very helpful to classify biomass energy as traditional and correlate its consumption with per capita GNP. In fact, wood and other biomass can be used in a traditional way, a modern way, or any way in between. Their consumption may be governed by many factors, amongst which per capita GNP appears not to be a significant one.

Presently in Asia, fossil fuel use is increasing faster than use of 'traditional fuels' over time. The country data from Asia show that this increase does not imply an overall process of fuel substitution with rising per capita GNP. Fossil fuel use essentially comes on top of biomass fuel use. To the extent that per capita GNP is a relevant parameter at all, the dominant process seems to be one of fuel complementation rather than fuel substitution when incomes rise. Similarly, aeroplanes do not substitute bicycles, they complement the modes of transport in times of rising incomes.

The importance of clarifying these points is more than just semantic. They are highly relevant for effective policies with a view to both assisting people and the energy-environment nexus. A policy of 'helping people to make the shift' can only be futile when there happens to be no shift. Policies of 'helping people where they stay' seem to be more apt, i.e. focussing on people's real priorities. In developing countries in Asia, cooking is by far the largest energy end-use activity.

In fact, 40% of all national energy consumption is in the domestic sector, and 78% of this relies on biomass, which mainly consists of wood. For many decades to come, this situation is not likely to change and, therefore, introduction of better biomass technologies is a top priority. Much needed improvements are safer, cleaner, more reliable, more convenient and affordable wood energy technologies for the masses. Fortunately, the larger part of biomass energy in Asia is used on a sustainable basis, and this has major benefits for the global environment (RWEDP, 1997).

The importance of wood and other biomass energy is still undervalued in donor policies. For instance, in the period 1980–95, the World Bank's total lending for sustainable supply and use of woodfuels was less than half its lending for rural electrification alone. At the same time, relatively few people in developing countries can afford to use electricity or even gas for their basic energy needs. Biomass energy development should be recognized as the main priority for improving the quality and convenient use of fuels and their reliable supply for the large majority of the population. Such objectives simultaneously support people in their daily energy struggles and assist local and global environmental management.

W.H.

References

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Figure 3: Wood/biomass energy consumption/cap vs per capita GNP, 1980–96, in Thailand