# CURBING ENERGY DEMAND? WHERE TO START?

## *USING INDICATORS TO UNDERSTAND TRENDS IN ENERGY USE*

### *Findings from an IEA Feasibility study*

*The International Energy Agency (IEA) has developed a methodology to analyse energy use based on so-called energy indicators and has recently finished a feasibility study to assess how this approach could be applied to India. An important focus of the study was to identify those institutions in India engaged in data collection, reporting and analysis. The study also reviewed the availability and quality of data for energy use analysis in India. The IEA is organising a workshop 18-19 April 2002 at Neemrana Fort-Palace outside New Delhi to present the findings from this study and to discuss follow-up aimed at improving data quality and reporting mechanisms. Representatives from key Indian institutions will participate in this workshop.*

### Expected energy demand growth poses challenges for India

By 2020, India's demand for commercial energy is expected to increase by more than 2.5 times *(IEA World Energy Outlook 2000).* Underpinning this trend will be the ongoing growth in population, urbanisation, income, industrial production and transport demand.

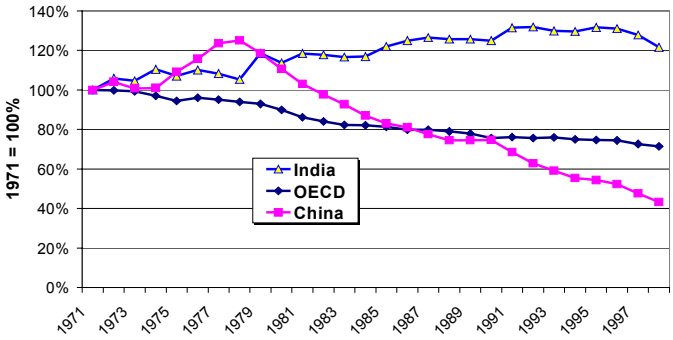
For India to tackle the economic and environmental challenge of its demand growth it is important to have a good understanding of how these and other factors shape energy use in the various sectors of the economy. Detailed and coherent information. is needed in order to judge the potential for energy efficiency improvements or to measure the progress of already implemented policies.

### Puzzling trends in Indian energy use

Take the puzzling trend in India's energy per GDP ratio as an example. As Figure 1 shows, the use of commercial energy per unit of GDP has increased in India since the early 1970s. This is in stark contrast to the developments in China and in OECD countries. Over the most recent years, however, the energy per GDP ratio in India turned around and started to decline.

Why this development? Is it due to changes in energy efficiency or changes in economic structure? The answer is probably both. To estimate how each of these two factors have affected the development more detailed data are needed.

*Figure 1: Primary supply of Commercial energy per unit of GDP*



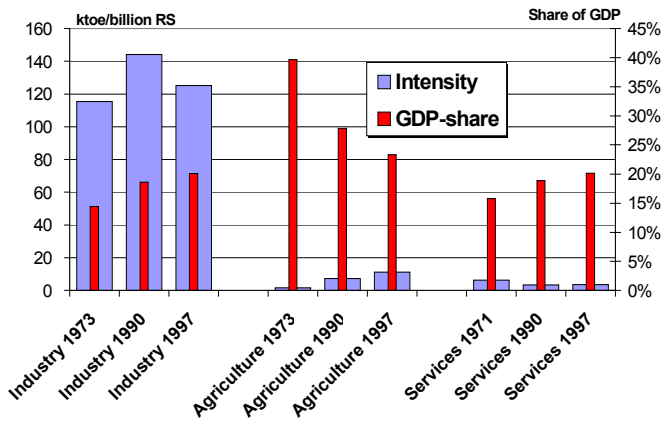

### The beginning of an explanation

Using data for energy use and economic activity, **indicators** representing energy intensities can be developed for different sectors of the Indian economy. Figure 2 shows these intensities (left axis) and the contribution each sector is making to overall GDP (right axis).

Three main findings arise from this figure:

First, note how much more energy is needed to generate one rupee of output in industry compared to the two other sectors. A small change in the level of output in industry can thus have a big impact on energy per GDP. Then note the increasing share industry has in total GDP. Given the high energy intensity of the industry sector, the increasing role of this sector in the Indian economy may offer part of the explanation behind the growth in the energy to GDP ratio. Finally, note also the increase and then decrease in the intensity for industry.

*Figure 2: Energy Intensities and GDP shares for three sectors of the Indian economy*



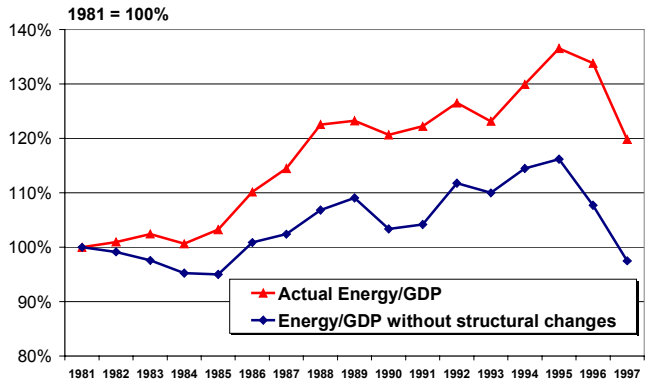
## Structural changes could hide changes in efficiency

Changes in sectoral energy intensities are related to changes in energy efficiency, while changes in economic structure are not. Let us therefore investigate how much structural changes and intensity changes each has affected the energy per GDP ratio in India. To do so we compare the development of the actual energy/GDP ratio with a hypothetical case where there were no changes in the relative GDP shares among the industry, services and agriculture sectors, i.e. no changes in economic structure. This means that in the hypothetical case only changes in the energy intensities of the three sectors affect the development. This is illustrated by the lower curve in Figure 3. The difference between the two curves in the figure thus represents the impact of structural changes.

The figure shows that during the 1990s structural changes played an important role. Without these structural changes energy per GDP would have increased very little between 1981 and 1991 (see the lower curve).

The figure also indicates that the drop in energy per GDP over the last few years seems to be due to falling intensities. As Figure 2 showed the drop in intensity happened primarily in industry. However, this drop may also be, at least partly, due to structural changes ***within*** industry itself and not necessarily due to energy efficiency improvements. For example, there may have been a shift away from energy intensive production of raw materials to production of less energy intensive products like electronics. Analysis of IEA countries shows that changes in industry structure have in fact had a significant impact on the decline in energy per unit output from industry that has taken place in most IEA countries.

*Figure 3: Changes in energy per GDP with and without changes in economic structure (Based on industry, agriculture and services)*




## Policy relevant analysis requires detailed information

The discussion above carries an important policy message since the changes in energy use due to structural changes are not related to changes in energy efficiency, while energy intensities are. As we have seen, the increase in the energy per GDP ratio in India was to a large extent due to structural changes between the main macro-economic sectors. Without taking this into account the conclusion could have been that there had been a serious reduction in energy efficiency in India. However, to more accurately assess energy efficiency developments, the potentially important structural changes that may have taken place *within* each sector (e.g., within industry) also need to be accounted for. This requires more detailed information than what is currently available.

If more detailed information was available, energy indicators for important end-use sectors like transport, industry, households, and services can be developed to better address the factors behind changes in Indian energy use, and in turn to allow for more informed policy decisions.

## Building up statistical capacity

Based on the assessments in the feasibility study, the IEA came to the following **main conclusions**:

- The driving forces of energy use are far from being clearly understood yet. At this stage, however, the existing Indian energy data needs to be reinforced on several fronts both to enable the building of indicators of energy use, as well as to get a better picture of the changes taking place in the energy sector;
- More effective co-ordination of energy data collection and processing exercises across sectors and fuels is essential to improve the understanding of changes taking place in the Indian energy system and economy;
- More capacity needs to be built in all statistical institutions involved in collecting and disseminating energy data in India;
- Methodologies to process energy data need to become more compatible with internationally accepted standards, such as the ones used by the IEA.

## IEA invites energy statisticians from India to a training workshop in Paris

To follow up issues related to methodology of data reporting and analysis, the IEA will organise a training workshop for Indian energy data experts at the IEA headquarters in Paris in October 2002. Details regarding this training will be discussed during the workshop at the Neemrana Fort-Palace.