

## Population and Environmental Issues

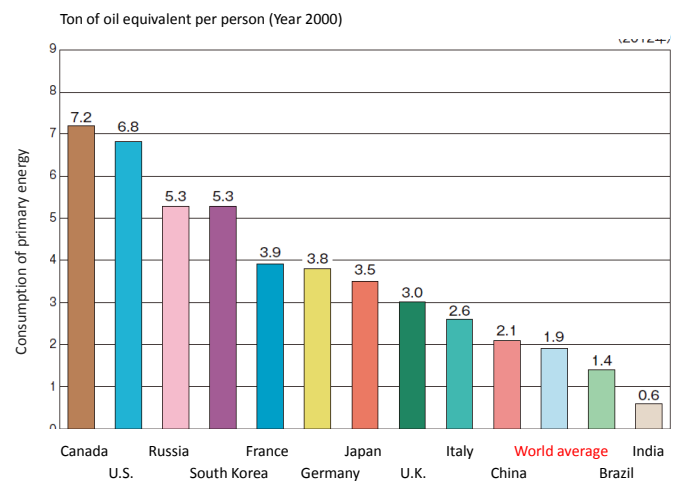
### 1. Population and environmental impact

In 2014, the Intergovernmental Panel on Climate Change (IPCC) published the Fifth Assessment Report (AR5), which posits that anthropogenic greenhouse gas emissions are, at “95% or higher” probability, the cause of global warming. The report’s multifaceted analysis of diverse factors affecting global warming converges on a common understanding that human activities have a dominant effect on global warming.

Some have argued in international fora that “the crux of the problem is excessive production and consumption, and not population”, maintaining that developed countries’ actions to reduce energy consumption that causes global warming are more important than efforts to stabilize population.

Indeed, energy consumption in developed countries, for example in the United States, is 10 times larger than that of India, which means that people in those countries are impinging 10 times greater environmental impact. However, we cannot realistically expect developed countries to lower their living standards or require developing countries to curb the rise of their living standards. What options do we have under these circumstances?

#### Primary Energy Consumption Per Capita



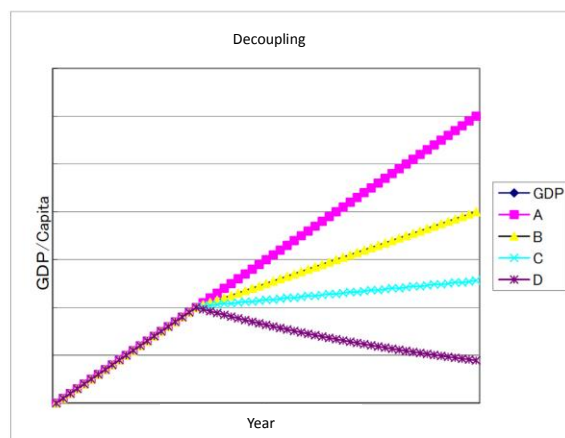
出典：IEA (ENERGY BALANCES OF OECD COUNTRIES (2014 Edition)) / ENERGY BALANCES OF NON-OECD COUNTRIES  
原子力・エネルギー図集 2015

### 2. Trilemma of population, environmental impact, and economic growth

In the “I = PAT” formula of Impact (environmental impact) = P (population) × A (affluence) × T (technology), the global environmental impact will grow exponentially if population increase (P) and economic growth (A) occur at the same time.

According to this formula, the only way to reduce environmental impact is through advancement in technology (T). This is sometimes described as “decoupling” through technology advancement. In other words, whereas expansion in economic activity would normally lead to a corresponding increase in environmental impact, technology development can mitigate its effect.

The figure on the right shows four scenarios of A, B, C and D. In case A, the environmental impact increases with the rise of affluence and there is no improvement in existing technology. In cases B and C, improvement in environmental technology pushes down the increase in environmental impact. In case D, innovative, breakthrough technology allows us to lower the environmental impact the more affluent we become.



In case A, the increase in environmental impact is exponential as it is further multiplied by population increase. Cases B and C correspond to the present-day efforts to suppress increase in environmental impact despite the rise in affluence; environmental impact will still grow from an increase in population. Although the technology envisioned in case D would be ideal if realized, that is very unlikely considering the law of entropy (second law of thermodynamics), one of the basic laws of physics.

Even though the work of engineers has made considerable energy savings possible, it remains impossible that the more energy we use, the more we reduce the environmental burden, regardless of progress in technology. Indeed, further improvements can yet be made in inefficient sectors, and Japan, with its pioneering experience in this field, can continue to play an important role. Nonetheless, when there is a growing population and affluence, environmental impact generally increases. The fast-paced rise in affluence in developing countries also means that environmental load induced by those countries is expanding.

Whereas the Kyoto Protocol of 1997 forged with Japan’s leadership underlined the responsibility of developed countries in preventing global warming, the Paris Agreement of 2016 clearly stated the responsibility of both developed and developing countries. In other words, developing countries will no longer be able to contend that they have no responsibility in averting global warming. On the other hand, the population is aging in Japan and other developed countries, some of which will also face a population decline. Paradoxically, population decline holds hope from the perspective of preserving the global environment.

The issues of population and the environment are, after all, closely intertwined. One of the basic measures should be to reduce the number of unwanted births by avoiding unintended pregnancies. These issues should be reexamined from a macroscopic, bird’s eye view and then discussed at the microscopic level.