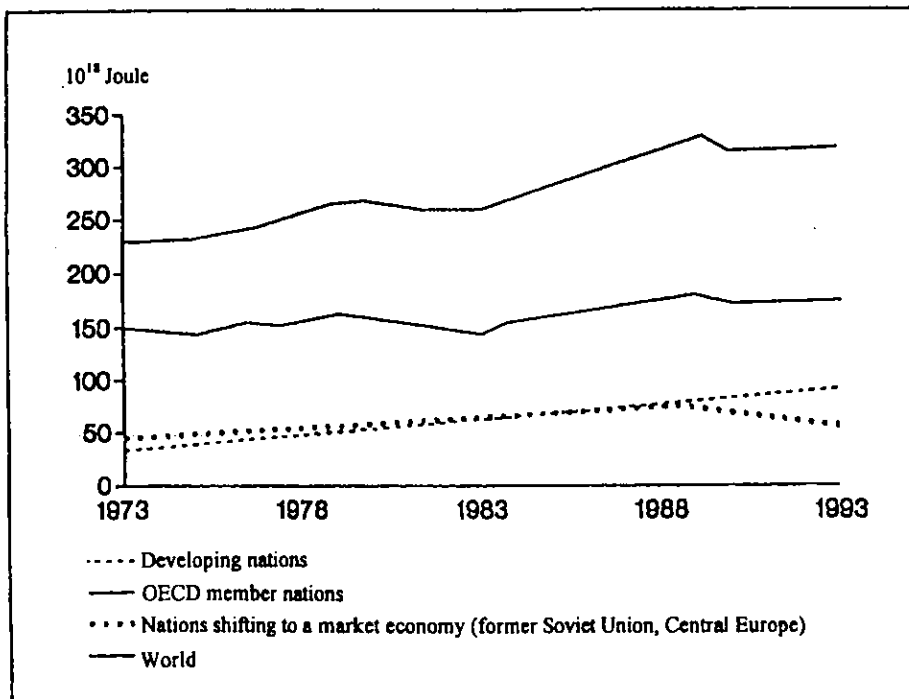


1.3 Air Pollution and the Issue of Resources

1.3.1 Energy and Air Pollution

Air pollution is brought about by substances like sulfur oxides, nitrogen oxides, soot and dust, hazardous substance, dust, carbon monoxide, and hydrocarbon species emitted from stationary source like factories and mobile sources like motor vehicles. Most air pollution is accounted for by combustion reactions to fossil fuels, but much air pollution caused by improvements made in combustion has been eliminated. Air pollution problems are closely related to problems with energy resources, and those material industries which directly employ these resources have become a major issue.

Energy consumption in developing nations, as shown in Fig. 1.3.1, has been increasing rapidly in recent years. Energy consumption levels in 1993 were nearly three times those in 1973. Emissions of air pollutants like sulfur oxides and nitrogen oxides have also increased along with the increases in energy consumption levels. To be more specific, there are countries which do not have flue-gas desulfurization equipment and flue-gas denitrification equipment, countries like China which are generating grave air pollution problems, and countries which, if left alone, may develop problems in the future.



Note: Indicates OECD member nations and economic cooperation and development system members.

Source: United Nations (U.N.) Statistical Division, 1993 Energy Statistics Yearbook (U.N., New York, 1995)

Fig. 1.3.1 World Energy Consumption, 1973-1993

In order to promote air pollution control measures in developing countries, steps must be taken which are in accord with the energy situation in each particular country. It must be noted that most developing countries are

expected to have increases in the consumption of coal, which is the richest of all fossil fuels. For example, China, which uses low quality coal containing high quantities of sulfur for 80% of its primary energy, has experienced serious damage due to acid rain.

Next, it must also be mentioned that the implementation of energy conservation measures are becoming most important for controlling air pollution. The implementation of energy conservation measures not only helps to conserve valuable energy resources, but the emission levels of air pollutants can be controlled by curtailing fuel consumption. In countries which do not have highly effective ways to use energy, there are more opportunities than in Japan to apply energy-saving technology, and if implemented, the results will be all the greater. It is hoped that energy conservation technologies like starved air combustion and waste heat recovery will become more widespread.

1.3.2 Air Pollution Control and Resource Recovery

Many of the flue-gas desulfurization facilities in Japan use methods which take the environment and resources into consideration. Most of these facilities utilize the abundant, good-quality limestone available in Japan in a process called the lime-gypsum method, which neutralizes and stabilizes the crude oil and large quantities of sulfur which are brought into the process in order to create the secondary product, gypsum, a resource which is rare in Japan and is used to produce nearly 2,300,000 tons of cement retarder, gypsum board, plaster, and calcinated gypsum per year.

At the present time, however, China has no prospects for a demand for such desulfurized gypsum, Korea does not have sufficient quantities of good-quality limestone, and the United States and Thailand, which have abundant gypsum resources, have not progressed much with applications of secondary desulfurized gypsum. Flue-gas desulfurization has not become very widespread in China, but if China were to develop methods to both reclaim sulfur oxides and nitrogen oxides at a low cost and obtain high-quality fertilizers like ammonium sulfate and ammonium nitrate and agricultural soil conditioners, then they would be able to kill two birds with one stone and stimulate improvements in agricultural production at the same time.

Treatment of the ash which derives from the coal combustion has also become a problem, and it is hoped that more effective utilization technologies will be developed because of the difficulties in securing disposal sites. It is effective to make practical use of desulfurized gypsum as a material resource, and it is being used as raw material for products like cement, cement compounds, roadbed materials, artificial light aggregates, fertilizers, snow melting materials, and materials for man-made gathering-places for fish, but more technological development is needed to make use of the vast quantities of limestone available. Fly ash is already being used in Japan as raw material for cement.

1.3.3 Resource Development and Environmental Issues

Active development of resources has accompanied economic progress in many countries, but there is a growing need for each of these countries to make further considerations for the environmental conservation. For example, in the processes of probing, development, operations, refining, and mine closure in the development of metal

resources, the world is now calling for resource development and environmental pollution control measures which take the environment into consideration. Most necessary are resource development plans which consider everything from the treatment of waste water after mine closures to post-closure measures and measures to restore land in regions undergoing development.

1.3.4 Securing and Treating Water for Industrial Use and Transportation Issues

Japan possesses an enormously long coastline and securing water for industrial use has not been difficult. Accordingly, there have been few problems operating wet flue-gas desulfurization facilities which require vast amounts of industrial-use water and limestone. In countries which have most of their factories located inland, however, it has been difficult to secure sufficient industrial-use water at times and it has not been easy to transport the limestone and secondary gypsum, so it has been difficult to increase the number of wet flue-gas desulfurization facilities like those in Japan. An enormous amount of energy is required for drainage water treatment and operations even if the water used is circulated.

1.3.5 Environment and Resource Issues

The above air pollution problems are deeply related to the problem of resources, and it is necessary to implement these measures so as to keep in line with the actual situations of resources and technology in the source regions. International cooperation is necessary in air pollution control measures, but it is even more necessary to have an understanding of the resource issues faced by each region.