5. ETHICAL ASPECTS OF ACCESS TO AND USE OF ENERGY

> Sustainable Energy Development is "energy produced and used in ways that support human development over the long term, in all its social, economic, and environmental dimensions..."
>
> *– World Energy Assessment – UNDP 2000*

5.1 Introduction

The concept of sustainable energy development has widened over a period of time to include economic, environmental, and social aspects, based on realities and constraints perceived by society. While the 1970s were dominated by economic concerns in the wake of the oil price shocks, environmental considerations began to gain prominence in the 1980s, as the threats posed by the oil crises diminished, and as environmental concerns became better understood. While local concerns received the first priority, by the late 1980s global environment concerns had become important. The Montreal Protocol of 1987 helped initiate phasing out of CFC emissions. The Intergovernmental Panel on Climate Change was set up in 1988, by the World Meteorological Organization and the United Nations Environment Programme. For the first time, the global environmental fallout of the energy sector was recognized and institutions were established to deal with the problem.

These concerns peaked in the 1990s when other stakeholders, industry and civil society, also became increasingly conscious of the impending environmental issues. The 1990s saw the social dimension of sustainability being recognized by the international community at large. There was growing recognition that energy strategies are inextricably linked to social development. It was recognized that energy services are a crucial input to primary development challenges of providing adequate food, shelter, clothing, water, sanitation, medical care, schooling, and access to information. The other related issues that received emphasis were those that linked energy to women's issues, demographic transitions (population trends and urbanization), and lifestyles.[1]

Over the period 1975-97, rapid economic growth and increases in population, urbanization, and income levels, along with programmes for industrialization and poverty reduction, generated a strong demand for commercial energy in the countries of the Asian continent. The total commercial energy consumption in Asia, as a share of the world, rose from around 23% in 1975, to 26% in 1985, and further to 34% in 1997, with East Asia recording the highest share within Asia. Also,

[1] Tata Energy Research Institute 2002. Sustainable Energy: Perspective for Asia, TERI, New Delhi.

China, Japan, India, and the Republic of Korea dominated commercial energy consumption in the region with a combined share of over 70% in 1997.

The various dimensions of sustainable energy development are well understood today as elaborated by the Ninth Session of the Commission on Sustainable Development (CSD)[2]: *Energy for sustainable development can be achieved by providing universal access to a cost-effective mix of energy resources compatible with different needs and requirements of various countries and regions. This should include giving a greater share of the energy mix to renewable energies, improving energy efficiency and greater reliance on advanced energy technologies, including fossil fuel technologies. Policies relating to energy for sustainable development intended to promote these objectives will address many of the issues of economic and social development as well as facilitate the responsible management of environmental resources*.

5.2 Patterns of Energy Consumption in Asia-Pacific

In general, the energy intensity of economies rises with economic growth and increases in energy consumption (often related to a shift from non-commercial to commercial forms of energy, industrialization, and motorization), while the efficiency of energy use may be low. Beyond a certain level of per capita income, it begins to decline, indicative of the overall increase in the efficiency of energy use, the switch to more efficient fuels, and the structural changes towards less energy-intensive production. The growth in per capita commercial energy consumption reflects a clear rich-poor divide, both across nations, as well as within nations. On average, less than 20% of rural households had access to electricity in South Asia in 1970. This implied large dependence on traditional fuels. A substantial proportion of the energy use in Asia is still serviced by traditional fuels.

The emerging economies in the Asia-Pacific region, countries like India, Bangladesh, Philippines, Maldives, Pakistan, North Korea, Laos, Mongolia etc., are major consumers of fossil fuel energy. These countries face serious problems in dealing with increasing dependence on imported fossil fuels and increasing investment in utilizing the vast renewable sources of energy to meet their growing needs. Moreover, accelerated efforts all over the world to increase GDP and alleviate poverty among the millions of poor in developing countries demand a huge investment in infrastructure projects, as well as improvement in the efficient usage of energy in all sectors. High capital investment costs and unclear policy directions hamper the growth of the Renewable Energy sector as an alternative to reduce Green House Gas (GHG) emissions.

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[2] Commission on Sustainable Development 2001. Report of the Ninth Session (5 May 2000 and 16-27 April 2001), (Economic and Social Council, Official Records, 2001, Supplement No. 9) <http://www.un.org/esa/sustdev/csd> United Nations, New York.

Fuel-mix

Around 55 and 61% of the primary energy consumption in India and China, respectively, was derived from coal in 2000, although a shift in favour of oil and gas was already under way. Likewise, in the case of West Asia, which is primarily served by oil and gas, the share of gas has increased over the last 25 years. In 2000, oil accounted for 53% of the total primary energy consumption, while the share of gas was 44%. The other major energy consumers, namely Japan and the Republic of Korea, being largely import-dependent, have diversified their fuel-mix towards a greater share of nuclear and natural gas. Some Southeast Asian economies, while increasing their share of gas, have also increased their share of coal. The reasons for these shifts range from a conscious diversification of the fuel mix to technological breakthroughs that have allowed the tapping of resources, such as gas.

Geothermal power is a major contributor to power generation in countries such as the Philippines; the country accounts for about 24% of the total installed geothermal capacity in the world. Other fast growing renewable energy sources include solar and wind. China, India, and Japan together accounted for nine percent of the world's cumulative installed wind turbine capacity in 2000. Japan, on the other hand, accounted for 45% of the solar installed capacity.

The provision of energy services directly impacts human development and the quality of life through energy's role in services ranging from cooking, provision of clean drinking water, and water and space heating to basic health care, education, and economic opportunities in agriculture, transport, and small-scale industries.

In terms of energy consumption, Asia still ranks very low compared to the American and European averages. South Asia with 20% of the world's population accounts for less than 2% of the gross world product (GWP), 5% of the global primary energy use and 3% of global energy-related net carbon emissions. The average per capita energy consumption in South Asia is the lowest in the world. In 1997/98, the average per capita energy consumption was 0.37 TOE (Tons of Oil Equivalent) compared to world's average of 1.7 TOE. Though the regional average has increased in recent years, it has remained far below the world's average. Similarly, the per capita oil consumption and per capita electricity consumption are also low compared to the world's average. However, when structural shifts in the economy take place, energy consumption, and its impact on the environment, is bound to be more.[3]

If one looks at the efficiency of various countries in converting energy into wealth, China and India use more energy to generate one dollar of GNP. China requires

[3] Asian Development Bank 1995. The Bank's Policy Initiative for the Energy Sector, Asian Development Bank.

46,000 BTU (British Thermal Unit) per dollar of GNP whereas India spends 31,000 BTU to generate a dollar of GNP. These two countries have higher rates of consumption of BTU per dollar of GNP than the USA, UK, France, etc. Most Asian countries are more or less in similar situation (Table 5.1).

Table 5.1. Energy Efficiency by country – 1995

Countries	*Per Capita BTU (Millions)*	*BTU per $ of GNP*
China	26.7	46 622
South Korea	115.07	11 345
Japan	141.83	3 472
Thailand	34.91	12 172
Indonesia	15.43	15 382
Kazakhstan	155.9	122 502
India	10.7	30 752
USA	327.5	12 583
United Kingdom	148.2	7 784

Source: http://www.ecoworld.com/Articles/May23_BTU_GNP.cfm

Thus, the energy efficiency of the economy in Asia needs to be improved. Agriculture and forests are the biggest solar energy converter system in the earth. With proper planning and implementation of sustainable agriculture practices (particularly the water use efficiency), not only the energy efficiency of the economy can be improved, but employment and poverty issues can also be addressed. At present agriculture uses very little proportion of the total energy consumption in Asia. (Table 5.2)

Table 5.2. Energy Consumption by Economic Sector in Asia[4]

Sector	*% of total Consumption 1990*	*% of total Consumption 1999*
Industries	47.0	36.2
Transportation	16.6	16.0
Agriculture	4.0	3.1
Residential	19.0	27.3

Source: http://earthtrends.wri.org/text/ENG/data_tables/data_table5.htm

Fuel wood consumption is considered an unsustainable practice. Many environmentalists have called for a reduction in fuel wood consumption, particularly in the developing world. But, in terms of employment, fuel wood use generates at least 20 times more local employment in South Asia than energy from oil products (per unit of energy). Any control measures over fuel wood usage,

[4] Excluding Middle East.

therefore, would have to take into consideration alternative employment opportunities.

5.3 Renewable Energy Options:

The attractiveness of renewable energy technologies, such as wind, solar, and biomass, lies primarily in their abundance. Biogas plants, applications of solar energy, such as lanterns and home lighting systems, and water pumping and heating systems are some technological interventions that have become popular in the last few years. The utilization capacity of these renewable energy sources depends on the status of technology, which results from a high degree of Research and Development. Wind is becoming the world's fastest growing power source. Wind energy is creating a great challenge to fossil fuel and is becoming competitive to fossil fuels in the generation of electricity. Wind could provide 12% of earth's electricity within two decades. However, solar and wind energy are an intermittent source of energy. That is, when sky is cloudy or breeze is down, power cannot be produced. Hence, the technology has to be developed further.

The method for storage of energy that is gaining attention is to use the power generated by solar and wind energy to produce hydrogen from the electrolysis of water, which can then be stored and used on demand. PV water pumps that are used in agricultural sectors, PV panels, Solar Cookers, Solar Air/water Heaters, etc., are some of the applications of solar energy that are gaining interest among people and industries (See Box 1). Some of the technological innovations in wind energy, especially power generators, are intellectual properties of developed countries. It is essential and ethical that the intellectual rights should not hamper the technological growth in the developing countries. International norms have to be created to facilitate easy transfer of technology between the developed and developing countries.

Biomass fuels

The usage of biomass as a fuel is the least controversial method for replacing the use of fossil fuels and mitigating CO_2 emissions. The biomass that helps to displace the use of coal in power plants is bagasse, and other crop residues. Developing countries have the maximum potential for Carbon Emission Reductions. There are around 464 sugar mills in India, which offer the most cost effective conversion of biomass to electricity.

Box 1. Decentralized applications of renewable energy technologies: examples from select Asian countries

China: Rural Electrification with wind/photovoltaic hybrids

In the Inner Mongolia Autonomous Region, about 150,000 small wind systems have been disseminated, powering about one-third of the un-electrified population. In the low-wind summer months, however, the system output drops to a fraction of its rated capacity and the batteries cannot be fully charged. This has led to the proliferation of micro-hybrids [addition of solar PV (photovoltaics) to wind systems]. In addition to lighting, radio, and television, the larger hybrid systems allow consumers to use refrigerators, washing machines, rice cookers, irons, and electric heaters.

Bangladesh: The success of Grameen Shakti

Grameen Shakti is a leading organization in the renewable energy sector affiliated to the Grameen Bank in Bangladesh. The organization aims not only at supplying renewable energy services, but also at creating employment and income-generating opportunities in rural Bangladesh. Its initiatives include supply, marketing, sales, testing, and development of renewable energy systems such as solar PV, biogas, and wind turbines. It also has installed more than 3185 solar PV systems, which have been used for a variety of applications in electronic repair shops, grocery stores, rice mills, telephone centres, and barbershops. The PV systems are also used for emergency lighting.

India: Government Initiatives

India ranks among the first worldwide in realizing the tremendous potential of renewable energy sources. The government has undertaken many programmes focusing on technology improvements for servicing the cooking and other requirements of the rural households. Notable among these is the biogas development programme. The biogas development programme was started in 1981/82. Of the total estimated potential of 12 million plants, 3.2 million family-type biogas plants have been installed along with community, institutional, and night soil-based biogas plants as of March 2001. With the current level of achievement, the programme is estimated to have resulted in a saving of 3.9 million tons of firewood and 0.9 million tons of urea per year as well as provided 5 million person-days of employment. The solar PV programme has found such decentralized applications as fixed and portable lighting units, water pumping, small power plants, power for telecommunication, railway signaling, offshore oil platforms, and television transmission. Solar PVs are being increasingly used for meeting the electrical energy needs in remote villages, hamlets, hospitals, and households in the hilly regions, forest areas, deserts, and islands of the country.

Source: Elsevier Advanced Technology (2001), MNES (undated), Urmee and Wimmer (1999) quoted in Sustainable Energy: Perspective for Asia, TERI New Delhi, 2002.

If all the Renewable Energy Technologies (RET) were to be successfully adopted in Asia-Pacific, like in India, it is estimated that the annual energy costs would decrease from 4,114 billion rupees to 4,019 billion rupees. In addition, carbon dioxide emissions would go down by 20% compared to the current business-as-usual scenario and, the emission of suspended particulate matter would be reduced by 24%.[5]

5.4 Trans-boundary Environmental Issues

Climate change:

Coal fired power plants, particularly poorly maintained ones, are significant polluters, causing diverse public health and environment problems. World energy needs of about 85% are met by combustion of fossil fuels, which leads in the production of pollutants like CO_2, NOx, SOx, smog, soot and haze. Combustion of fossil fuels continuously release CO_2 and other gases, which cause global warming and the associated sea level rise. The latest report by the Intergovernmental Panel on Climate Change (IPCC) has warned that global warming threatens human populations and the world's ecosystems with worsening heat waves, floods, drought, extreme weather, and the spread of infectious diseases.

The consumption of oil around the world is about 20 billions barrels annually. The US has four percent of the world's population, but it emits 25% of the global warming pollution. India emits about 4% of global warming pollutants. Carbon dioxide pollution building up in the atmosphere is the single biggest contributor to global warming; it is the major greenhouse gas. Power plants emit 40% of carbon dioxide, the primary global warming pollutant. A total carbon dioxide emission from all the coal-fired power plants in India was 1.1 thousand tons per day in 1997-98, and annual emission has been computed to be 395 million metric tons. Estimate of carbon dioxide emission from power sector in India for 1990 is 213 million metric tons. Currently, there is 30% more carbon dioxide in the atmosphere than there was at the start of the Industrial Revolution, and we are well on the way to doubling carbon dioxide levels in the atmosphere during this century. Of the total 6.1 billion population of the world creating anthropogenic emissions, 2.5 billion live in the developing countries and have no access to modern energy sources.[6]

It is projected that by year 2050 the world population will reach 9.3 billion, and the energy demand will increase by three times. The 1990s were the hottest decade on record. Average global temperature rose one degree Celsius during the last century, and the latest projections indicate an average temperature increase of two,

[5] IREDA NEWS Magazines 2002. Vol. 13, No. 3, No. 4.

[6] TERI Energy Data Directory & Yearbook 1999/2000. TERI, New Delhi.

to as much as ten, degrees during this century. To address the problem of global warming, steps need to be taken to combat the amount of emissions of carbon dioxide from power plants. Power generation has to switch from burning coal to the cleaner burning natural gas, combined with a large increase in energy efficiency and exploration of renewable wind and solar energy.

Though the contribution of most Asian economies to carbon dioxide emissions, in per capita terms, especially those in South Asia, is negligible as compared to the world average and the average of Organization for Economic Cooperation and Development (OECD) countries, due to the expected growth in emissions in some large Asian economies, like India and China, there is pressure on these countries to mitigate emissions. The Kyoto Protocol committed developed countries to make legally binding reductions in their greenhouse gas emissions. Under the agreement, industrialized nations must reduce their emissions of greenhouse gases by an average of 5.2 percent (from 1990 levels) by the period 2008 to 2012. Although a signatory, the US has still not ratified the treaty, in spite of being one of the major offenders in terms of high emissions, bringing to the fore the ethical question of the worst offenders being allowed to go free.[7]

The RAINS-Asia (Regional Air Pollution Information and Simulation Model for Asia) model, developed as an international cooperative venture involving scientists from Asia, Europe, and North America, with support from multilateral organizations, such as the World Bank and the Asian Development Bank, predicts that under the base scenario for 2020 (no major changes in economic and demographic trends or in energy and environment trends), sulphur emissions will increase from 33.6 million tons in 1990 to more than 110 million tons by 2020, an increase of 230% if no actions are taken to restrict emissions. The model predicts that large sections of southern and eastern China, northern and eastern India, the Korean peninsula, and northern and central Thailand will receive levels of acid deposition that will exceed the carrying capacity of the ecosystem. These could lead to irreversible ecosystem damage with far reaching implications for forestry, agriculture, fisheries, and tourism[8] – a cause for grave concern.

CDM and mitigation of GHG:

A strategy aimed at reducing fossil fuel consumption for a cleaner environment is the Clean Development Mechanism (CDM). CDM is a mechanism where companies in developed countries can invest in developing countries, such as in Asia-Pacific, to achieve carbon reduction objectives at a cost lower than what it

[7] The US produces more carbon dioxide than any other country, about 20 tons of airborne carbon per person per year, according to the International Energy Agency. http://www.cbc.ca/news/indepth/background/kyoto_protocol.html

[8] Downing, Ramankutty and Shah, 1997 quoted in ibid 1.

would have cost in the developed country. Corrective measures have to be taken in order to reduce the build up of CO_2 levels in the atmosphere. Global warming leads to great adverse effects on cycling of seasons, water resources, extreme change in climate events like coastal flooding, cyclones, severe drought etc. Climate changes lead to damage that is irreversible, and developing countries will be the most vulnerable to this change even though their contribution towards it is less. Hence, CDM has an important role in helping developing countries achieve sustainable development, but the crux lies in effective implementation.

Although switching to nuclear fuel is seen as a leading option for large reduction of CO_2 emissions by displacing fossil fuels, the related questions of cost involved for the establishment of nuclear power plants and the disposal of nuclear waste raise a number of issues. From the ecological perspective, an ethical question concerns the dumping of huge quantities of radioactive waste into the environment. Hence, switching to nuclear fuel is not seen as a preferable option until these concerns are resolved.

5.5 Energy Security and Policy Issues:

Energy is generally believed to be a limiting factor for economic growth in the developing world, while it remains a fundamental resource for continuing economic prosperity in the developed countries. While some Asian economies do not face a constraint with respect to energy availability, most are still grappling with energy shortages. Even in economies where access has been enhanced, low per capita energy consumption, particularly in rural areas, has constrained development. Given their low energy consumption levels and the structure of their economies, the linkage between energy consumption and economic growth is likely to remain strong in developing countries for sometime.

According to Agenda 21,[9] "Energy is essential to economic and social development and improved quality of life. Much of the world's energy, however, is currently produced and consumed in ways that could not be sustained if technology were to remain constant and if overall quantities were to increase substantially."

Energy efficiency and renewable energy, by reducing greenhouse gases and other air pollutant emissions, should form the main building blocks of any sustainable energy policy. Affordable access to such clean energy is seen to be one of the major elements of energy policy in most developing countries. This has been sought to be achieved mainly through ambitious electrification programmes and through large subsidies on electricity and other fuels for some consumers (poor, rural, and residential) or uses (irrigation, goods transportation, fertilizer production,

[9] United Nations 1992. Agenda 21: Report of the United Nations Conference on Environment and Development (New York: United Nations Division for Sustainable Development).

etc.). Countries also have special programmes depending upon their local situation, such as the farm forestry programme in India, in view of the dominance of biomass fuels, and the promotion of localized renewable energy systems as in Bangladesh, China, and India.

But despite subsidies, poor households in Asia pay a larger fraction of their incomes for energy than middle and high-income households, and they continue to depend predominantly on traditional fuels. Private funds are not yet flowing into many developing countries primarily due to perceived risks by investors. Attracting private investment (both foreign and domestic) requires fiscal and pricing reforms in the energy sector. Though the private sector is bound to play a larger role world over, the public sector will continue its role of a long-term guarantor. And, official development assistance may need to play a greater role in sustainable energy development in the least developed countries, which are not able to attract the private sector investment.

There is a need for a greater share of renewable energy sources given the problems of pollution associated with fossil fuels and the risks associated with nuclear energy. They can help meet critical energy needs, particularly in rural areas, and enhance energy independence. (See Box 2)

Significant opportunities exist to increase the use of renewable sources of energy in the Asia-Pacific region. Photovoltaic systems are, for instance, already established as economically and environmentally efficient ways of providing electric power to areas not connected to electricity grids, especially in rural areas.[10]

5.6 Conclusion

Expert perceptions reinforce the fact that while development in the energy sector may have been influenced, and perhaps at times driven, by international multilateral forces, the evolution of the sector and the integration of sustainability in various countries have been largely shaped by domestic imperatives.

This chapter has attempted to highlight the precarious situation on the energy front being faced by Asia-Pacific countries at the dawn of 21st century. This is mainly due to the exhaustible nature of the fossil fuel energy sources along with their associated pollution problems and GHG emissions. The percolation of Renewable Energy Technologies (RET), as an alternate for the fossil fuel energy, is still at a low level. Hence, the tapping of RET have to be increased in order to meet the power requirements of growing populations, and, at the same time, RET have to be commercialized, which will require a large trained workforce. Hence, in order to have sustainable development in the Asia-Pacific region, CDM can be used as a major potential source. Mitigation of GHG has been a great problem, as there

[10] Solar Energy Journal 2002. Vol. 72, No. 1, Vol .73, No. 5.

Box 2. Defining an Integrated Energy Strategy for India

Vision

To meet the energy needs of all segments of India's population in the most efficient and cost-effective manner and promoting rapid economic growth while ensuring long-term sustainability.

Provide clean and affordable energy to all

Promote the design and establishment of decentralized energy service providers design a basket of differentiated services available at differential prices to empower poorer customers to make a choice re-assign energy subsidy allocations towards the provision of micro-credit.

Ensure security of energy supply

Map all energy resources and develop a databank of technology choices, efficiencies and costs to facilitate evaluation of trade-offs between alternative energy paths facilitate investments in energy systems and efficiency improvements with the help of the private sector encourage Commercially-driven goal-oriented private and decentralized R&D (research and development) efforts channel public R&D funds towards reducing cost of energy delivery to the poor prepare energy plans to meet unforeseen emergency situations.

Improve the efficiency of the energy system

Open up energy markets to allow a larger number of players – public and private – in all market segments adequately empower independent regulatory authorities adopt uniform pricing principles, internalizing environmental costs, across all energy sub-sectors for meaningful competition and efficient resource allocation. De-link the social function of subsidy provision from energy pricing decisions institutionalize preparation of information systems, and communication and education programmes for promoting energy efficiency.

Reduce the adverse environmental impacts of energy use

Accelerate the development and market adoption of environmentally friendly technologies. Strategically exploit opportunities arising out of international agreements such as climate change and the WTO (World Trade Organization) to meet energy goals establish and enforce appropriate environmental standards.

Source: www.teriin.org

is no well-equipped technology to accomplish it. But, the indirect and best way that can be adopted for the mitigation of GHG may be switching over from the use of fossil fuels to renewable energy forms like solar, wind energy, biomass etc. Wind, Solar, Photo Voltaic and a few other renewable energy sources development depend on the technical know-how sharing between the developed countries and rest of the world in order for RET to achieve a breakthrough. Using these technologies will also minimize irreversible damage caused to the climate.

A sustainable energy future requires strategies that address the goals of efficiency and cost competitiveness, universal access, energy security, and environmental accountability of energy systems. These strategies should include continued market reform, greater role for decentralized energy systems based on renewable energy sources, technological diffusion, and financial flows into developing countries, generally improving energy efficiency with a focus on demand-side management and the establishment of efficient structures.[11]

[11] ibid 1.