

A brief appraisal of existing main environmental issues in Nepal and potential intervention to solve the perceived problems

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In Nepal, various developmental activities have created a number of environmental problems such as loss of forest, forest degradation, soil erosion, air pollution, water pollution and unmanaged solid-waste. It is imperative that environmental consideration and its management in development planning play a crucial role in enabling and sustaining poverty reduction. To overcome environmental problems, the Government, NGOs, & INGOs have successfully applied and stressed for potential intervention through policy and legislative measures and various economic instruments. This paper highlights briefly the present main environmental issues in Nepal, and stresses the potential intervention through various measures to mitigate the perceived environmental problems.

Key Words: Environment, pollution, measures, forest, degradation, soil, instrument

Nepal is one of the most ecologically wealthy but economically distressed countries in South Asia. The country is rich in ecological diversities with slightly over 80 percent of the land covered by rugged hills and mountains. In Nepal, various developmental activities have created a number of environmental problems due to inadequate consideration of the environmental aspects and management of natural resources in a sustainable manner. Consideration of environment in development activities has evolved from the mid 1980s when the Government of Nepal (GoN, then His Majesty's Government of Nepal) endorsed the national conservation strategy. The environmental campaign was geared up only after the restoration of democracy in the beginning of 1990s. Particularly, since the country's high-level participation in the Rio Earth summit in 1992, the value of environmental management has been realized at different levels such as political, developmental and socio-economical. The Government of Nepal has given mandate to the Environmental Protection Council 1992 to advise the government on environmental affairs. Realizing the need of the integration of the environmental aspects through institutional arrangement in development planning and administration, the GoN has established the Ministry of Population and Environment (MOPE) on 22nd September, 1995. During the period, the Ministry focused its activities to prepare and enforce environmental legislation and guidelines, human resource development for the environmental sector, formulation and implementation of policies,

plans, and programs, monitoring and evaluating programs and create public awareness. In the early 2005, the MOPE was dissolved and its Environment Division was merged with the then Ministry of Science and Technology which was later renamed as the Ministry of Environment, Science and Technology (MOEST).

Environmental issues

The causes and consequences of environmental degradation may be of different magnitude and scale, and are changing both in urban and rural areas. The urban environmental problems are more related to pollution and the resultant effects on human health is apparent whereas in the rural areas where about 90 percent of the total population resides, environmental problems are largely related to depletion of forest resources, loss of top soil, watershed disruption, landslides, decline in farm production, flooding, indoor pollution and misuse of pesticides and insecticides. All these have cumulative effects on physio-biological and socio-economic environment and the quality of life. The Environmental Protection Council has identified the following environmental issues for Nepal:

i) Loss of forest

Use of forests and their products for different purposes has significantly changed forest cover during the last four decades in Nepal. Of the total 6.4 million ha of forest estimated in 1964, only 5.5 million ha

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forest area was in natural stock. It was estimated that a total of 0.1 million ha forest in the Siwalik and Terai were cleared under the government settlement program during 1950-1985 (DFRS, 1999). Depletion of forest area is further aggravated as a result of overgrazing, excessive fuelwood collection, continued extraction of non-timber forest products, fire, conversion of forest land to cropland and infrastructure development such as road, canals and transmission line. According to the DFRS (1999), more than 120,000 ha forest has been cleared for infrastructure development. The Terai and the middle mountain regions are severely affected by the change in forest cover (HMG/ADB/FINNIDA, 1988). About 15 percent of the forest area in the Terai region has been lost during the period of 12 years between 1978/79 and 1990/91. Based on this information, the present deforestation rate particularly in the Terai has been estimated to be 1.3 percent per annum (FORESC, 1994).

Forest is the principle source of fuel wood in Nepal. According to the Ministry of Finance, energy consumption in Nepal excessively depends on fuelwood which represents 78% of the total fuel consumption. In the rural areas, wood consumption exceeds 94% of the total fuel consumption thereby causing excessive depletion of the forest area (WECS, 2006).

ii) Loss of bio-diversity

Nepal is in the 25th position in terms of species richness at the global level. It covers only about 0.1 percent of the total land mass of the world but harbors about 2 percent of flowering plants, 3 percent of pteridophytes and 6 percent of bryophytes of the world's flora. About 5 percent (246 species) of the total flora reported are endemic to the country (MFSC, 1997). In 1996, the Trust for Nature Conservation (then King Mahendra Trust for Nature Conservation) reported that 48 species of plants, 26 mammals, 8 birds and 3 reptiles were categorized as being endangered. Obviously, the primary reason behind the loss of biodiversity is habitat loss or disturbances. In general, species outside the protected areas are under great pressure due to habitat loss and or degradation, over-extraction and illegal collection of forest products and poaching & hunting of wild animals. Wild animals are illegally hunted or poached due to increase in price of their products. For example, the sloth bear is hunted for its gall bladder, rhino for horn and tiger and leopard for skin and

bones. Altogether 63 rhinos were either illegally hunted or poached during the last two decades (MFSC, 1997; DNPWC, 2001). Clearing and burning forests, draining and filling wetlands, converting natural ecosystems into agricultural land, and meeting the demand for fuelwood, fodder, litter, medicinal plants, and animals for meat and other requirements have resulted in a huge loss of biodiversity (ADB/ICIMOD, 2006).

iii) Soil erosion

Over two-thirds of Nepal's total land area of 14.7 million hectares falls under the watersheds of the major river systems viz. Koshi, Gandaki and Karnali. At present, about 0.4 percent, 1.5 percent and 11.7 percent of the watersheds are reported to be in very poor, poor, and fair conditions in terms of land degradation. Apart from the soil loss due to natural causes, various human activities such as encroachment on the forest land, cultivation on steep-land, improper farming activities and over grazing have ultimately led to heavy loss of soil and thereby declining soil fertility. Intensity of soil loss is found to be less in the cultivated lowlands as compared to that in the rain-fed sloping terraces, ranging from as low as 7.8 tons/ha/year in the forested Swanlike hills to as much as 570 tons/ha/year in the unforested mid-hills (CBS, 2004). The Department of Soil Conservation estimates that on an average, 1.7 mm of topsoil is being eroded in each monsoon cycle (Wagley, 1997). It has been reported that about one-third of the total area has either little or is devoid of vegetation cover, while two-third of the country is geologically fragile. In the Middle Mountains, the man : land ratio is comparatively high and soil erosion is pronounced due to the vegetative cover being replaced by annual crop as a part of subsistence living.

iv) Air pollution

People are facing the problems of air pollution in two ways - indoor air pollution in the rural areas and outdoor pollution in the urban areas. The rural areas are engulfed by heavy indoor air pollution that results from combustion of biomass in the poorly ventilated kitchen room. The smoke from biomass fuels is a complex mixture of aerosols containing significant amounts of carbon monoxide, suspended particulate matter, hydrocarbons, and NO_x (Naeher *et al.*, 2005). Exposure to indoor air pollution carries severe health threats. Exposure to the smoke from a day's cooking is equivalent to smoking two packets of cigarettes directly affecting lungs, chest and other problems

(Warwick *et al.*, 2004). Studies have also been conducted to know the level and impact of indoor pollution on human health in the rural areas. A study revealed that women spend about 20 percent of their work time in cooking-related-activities and they are exposed to smoke with all the consequences of acute respiratory tract infection and chronic bronchitis. The prevalence of chronic bronchitis is maximum with 29.0 percent in Jumla and 8 percent in the middle hill region of urban Kathmandu. Indoor pollution in industries also poses a considerable threat to the health of workers (Pandey, 1985).

The major concern of air pollution is outdoor pollution in urban areas. Vehicular traffic in the towns like Pokhara, Kathmandu, Biratnagar and Birgunj has been increasing rapidly. The major sources of air pollution are vehicular and industrial emissions and combustion of fossil fuels. Vehicular emission is much aggravated by leaded fuel, narrow streets, and poor traffic management, import of old vehicles and poor maintenance. The number of vehicles registered in Nepal as of March, 1998 totals about 0.2 million comprising of more than 50% of two wheelers. Among the vehicles, buses and trucks, tempos and two stroke motorcycles are probably the most significant contributors of air pollution. Studies conducted on air quality in Kathmandu Valley have shown that ambient suspended particulate matter exceeded the WHO limits (Devkota, 1998). Nepal is now trying to control vehicular exhaust emission through color rating i.e. issuing green and red stickers as per vehicle performance and exhaust emission standards. It is notable that high number of diesel vehicles are not able to get green stickers. In the absence of continuous monitoring of ambient air quality, it is virtually impossible to derive any significant conclusion on quality scenarios. Further deterioration of air quality is expected due to continuous increase of different types of vehicles in the city, complaints of fuel adulteration and inefficient vehicle repair and maintenance workshops.

Industries also contribute to increase the ambient load of air pollutants. An industrial pollution inventory carried out by the Industrial Pollution Control Management Project indicated altogether 3,150 numbers of air polluting industries, which emit about 76,400 tons of total suspended particulate matter (TSP) annually. TSP load in the Kathmandu Valley atmosphere from medium and large sized industrial sectors is estimated to be 104 tons per day (Devkota and Neupane, 1994).

The quality of the petrol and diesel fuel generally available in the market has also contributed to air pollution because of the low octane and high content of lead and carbon. The study showed that the lead concentrations in the ambient air in the municipal streets of Kathmandu city are many fold higher than the background value found in the normal soil (<0.01 PPM for garden soil). When solid particles containing lead are inhaled, they are trapped in the blood system causing adverse effect on blood formation, vitamin metabolism and neurological process (Bhattarai and Shrestha, 1981).

v) Water pollution

Water resource is one of the major natural endowments of Nepal. The country is drained by more than 6,000 rivers with considerable flow variation. The water is also highly contaminated with calceiform bacteria, iron and ammonia, and exceeds WHO standards. water pollution is the most serious public health issue in Nepal. The rivers have become major places for urban solid waste disposal and dumping, and for industrial effluents, all of which are responsible for deteriorating the river-water quality and contributing to waterborne diseases e.g. diarrhea, dysentery, cholera and typhoid resulting from consumption of contaminated water. These water-related diseases are generally caused by poor sanitation and poor water quality (DOHS, 2005). Use of ground water for drinking purpose is extensive in the Kathmandu Valley. About 46 percent of water supply in Kathmandu and Lalitpur is from underground source. Drinking water in most of the rural parts also experience biological contamination. River sources along the human settlements in the country are virtually unfit for human use. One year water quality monitoring record of the Bagmati river indicates a high level of discharge and or disposal of oxygen-demanding-wastes in the river. Most of the houses and industries in the Kathmandu Valley directly drain their sewage, animal waste and biomass into the streams or near the water sources. A water pollution study in the Kathmandu Valley reveals that domestic effluent is nine times greater than the industrial output (NESS, 1995). The records at the Sukraraj Tropical Infectious Disease Hospital in Kathmandu show that about 16% of all deaths are due to waterborne diseases (STIDH, 2004).

vi) Solid waste

Solid waste is a common environmental problem in urban areas. Major cities have experienced high rate

of population growth and unmanaged urban development resulting in an increasing volume of solid waste. The inappropriate solidwaste disposal on rivers has adversely affected the quality of water and aesthetic value of rivers and cities. In the Kathmandu Valley, the people from the settlement area wrap garbage in polythene bags and either throw it in open spaces or put it outside around their household boundaries so that municipal authorities collect the household wastes and dump them in the available open spaces or on river bank or in the sanitary landfill site. Chemical, industrial and hospital wastes are hazardous. The fate of hazardous wastes is still unknown. Generation of wastes in the health institutions is approximately 5.71 kg per patient per day and out of which nearly 30 percent is hazardous by nature. Due to the lack of separate provisions for managing such wastes, they are mixed with municipal refuses. Solid waste management problem is often experienced in the Kathmandu Valley and is gradually spreading in other municipalities like Pokhara, Biratnagar, Birganj and Nepalgunj. The solid waste problems are multifaceted because of the change in volume and characters of waste generation, inadequate technology transfer and adoption and lack of public awareness and proper management skills (Khanal, 1993; ADB/ICIMOD, 2006).

Potential intervention for the perceived environmental problems

The potential intervention for the recognized environmental issues initiated by the Government of Nepal in order to manage the environment are mainly policy measures, legislative measures and economic measures. They are as follows:

i) Policy measures

The need for the integration of environmental aspects in the development planning was realized in the mid - 1970s. The Fifth Plan (1975-1980) adopted policies and programs on land use, soil conservation and management of National Parks & Reserves. A national level environmental-friendly policy for the first time was included in the Seventh Plan (1985-1990). Importance of public participation in the decision making process and the role of women and NGOs was also emphasized for the management of the environment. A national conservation strategy and Master Plan for Forestry Sector were endorsed and implementation started during the plan period. The Eight Plan (1992-1997) re-enforced environment

management with specific reference to sustainable economic growth, and poverty alleviation. The plan emphasized the need for internalizing the Environmental Impact Assessment (EIA) system particularly in development plan and programs. It emphasized the improvement of legislative measures and promotion of environmental awareness at different levels. During this period, Master Plans for Irrigation and Livestock were also prepared by integrating environmental aspects. Similarly, environmental aspects in the policies of hydro-power, irrigation and industry were incorporated (EPC, 1993; MOPE, 1998).

The Tenth Plan (2002- 2007) re-emphasized environment management as a national level policy. The 10th plan also focuses on internalizing EIA system and encouraging participation of NGOs and private sector in EIA related works. The ninth plan has emphasized to discourage cultivation on unsuitable areas for farming like erosion-prone hills, develop a basis for the promotion of environmental activities of the NGOs and the private sectors including expansion of environmental health programs, conservation and management of wetlands, promotion of community forestry through forestry user groups, leasehold forestry management and adoption of appropriate measures to make the city core area pollution-free even by restricting vehicle entry (NPC, 2002) and regular testing of vehicular emission. In spite of these policy intervention and local people involvement, the environmental damage is still increasing.

ii) Legislative measures

Prior to the legal provisions on environmental assessment, the Government of Nepal implemented National EIA guidelines for forestry and industry sectors in 1995 in order to facilitate the integration of the environmental aspects in the development projects and programs.

The present constitution of Nepal 1990 Article 26 (4) exclusively mentions environmental consideration in the "Directive Principles of the State". Based on the constitution, a Parliamentary Committee on Environment Conservation has been constituted in May, 1998 to deal with the issues on environment, forest, soil conservation, industry, housing and physical planning.

There are various sectoral legislations enacted after 1990 dealing directly or indirectly to environmental

issues. But after the establishment of Ministry of Population and Environment in 1995, the GoN promulgated the Environmental Protection Act 1996 and its regulations in 1997, and has made it mandatory for most of the developmental projects. The Project has been identified to undertake either an Initial Environmental Examination (IEE) or an Environmental Impact Assessment (EIA) study. Whichever is undertaken, the environmental assessment process should explore baseline information about the project and its site, impact identification of socio-economic, biochemical, geophysical and cultural aspects, alternative options, and mitigation measures of adverse impacts. It is mandated that EIA will be reviewed and passed by the Ministry of Population and Environment whereas concerned ministries will deal with IEE (MOPE, 1997).

Altogether, 216 types of developmental activities or projects should follow the environmental assessment process (IEE or EIA). The majority of such projects involve water resources utilization, industry establishment, and road construction. Regarding pollution management, environment protection rule envisages an environmental permit system and the polluters shall have to comply with the environmental standards. A maximum penalty of 0.1 million rupees may be imposed upon any one who implement any project without receiving approval for the IEE/EIA report. Since the Government of Nepal is lagging behind in monitoring the IEE and EIA granted projects, environmental assessment is limited to being an administrative tool, such as a license procedure. The present project orientation of the IEE/EIA process at the top level could hardly deliver its environmental message to the village level where the crux of problems exists. Most of the village-level development programs can be economically feasible but are environmentally unfeasible. Such development activities have to be carried on without due consideration of the environment due to political interest or pressure. The mechanisms to incorporate the environment into developmental activities at the local governmental level are virtually non-existent and the Ministry of Population and Environment so far has not been able to address this agenda at the policy level (Devkota, 1998).

Economic Instruments

Along with the policy and legal measures, environmental management could be possible

through the introduction of economic instrument to attract different stakeholders to comply with the standards.

Economic instruments like subsidies on biogas plants in the rural areas are likely to have positive impacts on the environment as majority of the local people depend on firewood to meet their energy demand as well as to minimize indoor air-pollution. The government has the policy of providing interest-free loan with a repayment period of seven years and direct subsidy of NRs. 5,000 per plant through Agriculture Development Bank. From this incentive, it has been estimated that about 4.8 tons to 6.5 tons of annual fuelwood per household are being saved (MOPE, 1998). Similarly, Alternative Energy Promotion Center in collaboration with INGOs and Private Sector has initiated economic instruments like biogas plants to replace fuelwood for cooking and lighting thereby helping to conserve forests. The number of Biogas Plants has increased from about 200 in 1975 to 90,000 in 2002 in 66 districts of the country. Likewise, economic instrument such as Improved Cooking Stove Program has been designed to increase the efficiency of firewood use and to reduce smoke. Over 90,000 improved stoves of various types are being distributed throughout the country (ADB/ICIMOD, 2006). Similarly, occurrence of chronic bronchitis and obstructive lung diseases would also be minimized which largely occur in the rural parts of Nepal from firewood burning. The policy of subsidy on kerosene would also contribute to reduce pressure on forests.

The Environmental Protection Act 1996 has a provision to provide additional concession and facilities to encourage the industry and enterprises to adopt technologies and processes which cause positive impacts on the environment. The industrial policy also promotes the use of cleaner technologies to increase efficiency in resource use. The National Parks and Wildlife Conservation Act, 1973 (amended in 1993) provides a special provision to allocate 30 to 50 percent of the total revenue generated in the protected areas for community development. The promotion of community forests has also direct benefit to the local people to meet the demand of forest products and generated income would be used for community development. These recent economic instruments are expected to bring a positive change in socio-economic condition thereby improving the environmental condition as well (MOPE, 1998).

Discussion and Recommendations

In order to deliver the message of Environmental Protection Act, there should be a strong monitoring mechanism of environmental assessment (IEE or EIA) granted project. Internalization of environmental assessment process should be encouraged to the line ministries and at district level. The responsibility of MOEST should be to monitor or even to audit national project.

The MOEST as an environmental manager in the country should lead to manage environmental pollution either by itself or by establishing a competent and an independent body like "Pollution Control Authority".

There is an inadequate facility for safe collection, segregation, transportation and disposal of domestic sewage and municipal waste. A recent policy on inviting the local community and private sector for waste management would possibly help to reuse the waste and show that the waste has a value.

Effectiveness of present color rating system of vehicles in terms of environmental health system needs to be examined. Private sector should also be encouraged to take the responsibility of monitoring of exhaust emission. Besides this, government should control numbers of vehicles entry each year with respect to carrying capacity of the roads within the municipalities.

Biodiversity outside the protected areas are under great pressure due to habitat loss, fragmentation and or degradation, unregulated collection of forest product, and poaching & hunting of wild animals. The GoN has prepared a National Biodiversity Implantation Plan (2006-2010) to proceed for biodiversity management.

At present, incorporating environmental aspect in sectoral policies and sectoral legislation that are enacted or amended after 1990 has indicated the Government's commitments towards mitigating environmental issues in the nation. Similarly, the Environment Protection Act 1996 and the Environment Protection Rule 1997 have been enforced since Jun 1997. Few economic instruments are also in place to encourage different stakeholders to conserve the environment effectively. Besides all these, if the present trend of population growth is not controlled, poverty is not alleviated, political

commitment is not ensured and if the continuation of the existing consumption pattern and resource constraints remain the same, environmental degradation are likely to continue in future too.

Conclusion

Major environmental issues have emerged from excessive dependence on the use of natural resources, land degradation, depletion of forest resources, unscientific urban development and discharge of untreated effluents, disposal of solid wastes and inadequate integration of the environmental aspects in development planning and implementation. Development of the nation will not be sustainable unless the environment is integrated with development works and its management is ensured.

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