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Situation Analysis of Environmental Health in Nepal

(Final Report)

Centre for Economic and Technical Studies
&
Creative Consultants

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With an increase in the level of land, air, water and noise pollution in various parts of the country, particularly in the urban and metropolitan areas, Nepal has been facing pressure in environmental health sector. Certain activities by the national and international organizations to improve the environmental health conditions proved useful. But the problem is not adequately addressed. With this view in mind, an effort has been made in the present study to bring situation analysis of environmental health sector so that it could contribute towards developing plans and programs to mitigate the problems.

Valuable suggestions received from experts, particularly Professor Gopal Prasad Acharya, Chairman, NHRC, Dr. Kamal Gyawali, Member Secretary, NHRC and Mr. Jan A. Speets, Advisor, Environmental Health, proved immensely useful in preparing the report and for this we express our gratitude to them. Also, we are indebted to Mr. Chandra Shekhar Yadav, Environmental Engineer, NHRC for supporting us as a resource person/project co-ordinator and guiding us all through the study period. Our thanks are also due to Mr. Sharad Aryal and Mr. Chandra Bhusan Yadav for working as study team members. We would also like to express our gratitude to Dr. P.K. Jha, Consultant, Mr. Jayendra Karki, Consultant and all those who supported us through their valuable suggestions. Basically, the report is prepared for the policy makers, planners and implementing agencies engaged in environmental health sector in Nepal. But it might prove equally useful to the students, professionals, media people and all those interested in environmental health problems.

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Abbreviations

AIC	Agricultural Input Corporation
BHF	British Heart Foundation
BOD	Biological Oxygen Demand
CDB	Cotton Development Board
CDR	Central Development Region
CO	Carbon Monoxide
DHUD	Department of Housing and Urban Department
DWSS	Department of Water Supply and Sewerage
EIA	Environment Impact Assessment
ENPHO	Environment and Public Health Organization
EPA	Environment Protection Act
EPC	Environment Protection Council
EPR	Environment Protection Rules
ESS	Environment Sanction Section
ETS	Environmental Tobacco Smoking
EURO	European Union Standards
GDP	Gross Domestic Product
JRCS	Japan Red Cross Society
KMC	Kathmandu Metropolitan City
MCP	Malaria Control Programme
MoAC	Ministry of Agriculture and Cooperation
MoC	Ministry of Commerce
MoFS	Ministry of Forest and Soil Conservation
MoH	Ministry of Health
MoI	Ministry of Industry
MoPE	Ministry of Population and Environment
MoPPW	Ministry of Physical Planning and Works
MoS	Ministry of Suppliers
NARC	Nepal Agricultural Research Council
NEA	Nepal Electricity Authority
NEHI	Nepal Environmental Health Initiative
NEPAP	Nepal Environment Policy and Action Plan
NESS	Nepal Environmental and Scientific Services
NFHS	Nepal Family Health Survey
NHRC	Nepal Health Research Council
NOx	Nitrogen Oxides
NPC	National Planning Commission
NWSC	Nepal Water Supply Corporation
OPD	Out Patient
OSS	On-Site-System
PAHs	Polycyclic Aromatic Hydrocarbons
SoE	State of Environment
SPM	Suspended Particulate Matter

TSP	Total Suspended Particulate
TSS	Total Suspended Solid
TUTH	Tribhuvan University Teaching Hospital
UNCED	United Nations Conference on Environment Department
VDC	Village Development Committees
WECS	Water and Energy Commission Secretariat
WHO	World Health Organization

Executive Summary

Environmental health incorporates environmental issues affecting public health. The subject, though important to the planners, policy makers, government and other related institutions, was not given due weightage until the introduction of Nepal Environment Policy and Action Plan (NEPAP) in 1993. Increased population, uncontrolled urbanization, vehicle emission, industrialization, land degradation and bio-diversity loss are some of the important factors responsible for the degradation of air, water, land and noise quality. Environmental problem is common both in rural and urban areas. But it is conspicuous more in the urban areas, mainly in Kathmandu Valley. As a result, the human health is affected. The bio-diversity is affected to such an extent that a number of species have become extinct and the lives of many others are endangered.

While making situation analysis of environmental health, the study intended to (a) review the health and environment status, (b) identify existing policies, standards and guidelines on environment and health, (c) discuss the impacts of changing environment on health, (d) assess the existing infrastructure and capabilities of environment and health institutions; and (e) suggest an action plan. To achieve some of these objectives, the study was based on both primary and secondary source materials for data collection.

The environment and health issues are under the exclusive jurisdiction of MoPE (1996) and the MoH (1956), though some other ministries and institutions have also addressed the problems. The MoPE and MoH have developed policies, guidelines and standards in related fields. But they are not adequate, particularly in environmental health sector. Whatever policies, guidelines and standards exist, they are not enforced effectively by the concerned organizations. Besides, the concerned stakeholders have not properly visualized the gravity of the situation for developing environmental health policy. This is due to the poor coordinating mechanism at the inter-ministerial level in regard to environmental health issues. There is also duplication in programme activities and confusion towards the implementation, monitoring and evaluation of programmes. Hence, policies, programmes, guidelines and standards on specific issues should be developed not in isolation but by integrating environmental and health issues related to air, water, land and noise pollution.

Over the years, the health status of the people in all such fields as infant mortality, child mortality, average life expectancy and maternal mortality has been improving. But it is more due to an increase in health services rather than an improvement in the quality of environmental health situation. In the environmental sector, the ambient air pollution level mostly in the urban areas has been affected due to the presence of parameters, including particulate matter, carbon monoxide, carbon dioxide, sulphur dioxide and lead. The vehicular pollution and poor road condition are major contributing factors for ambient air pollution. Indoor air pollution largely caused by biomass (firewood) has proved

hazardous to public health due to the concentration of PM_{10} and other such factors. Biomass burning is the most severe cause of indoor pollution. Indoor pollution is also caused by tobacco smoking. Additionally, water quality is affected mainly due to the contamination of river water, underground water and surface water through the discharge of effluent of polluting industries and untreated sewerage in the water. High level of bacteriological contamination of water largely caused by faecal contamination is a serious problem in Kathmandu. In the Terai, arsenic contamination of water is a matter of concern in certain pockets. Land is getting polluted through the haphazard use and misuse of chemicals and pesticides, household hazardous wastes, municipal solid wastes and hospital wastes. Noise pollution mainly caused by the mufflers fitted into the vehicles and use of horns have also been rising. Because of these problems, the public health in Nepal is getting affected.

Changing environment has caused several health problems. In this regard, the workers in carpet, garment, textile, stone and marble, brick, cigarette and other such hazardous factories have experienced major health problems due to the lack of occupational health standards. Agricultural workers, too, have been affected through the use and misuse of harmful pesticide chemicals. Of the different kinds of emissions, the motor vehicle exhaust in the form of lead, carbon monoxide, sulphur oxide, nitrogen oxide, ozone and photochemical oxidants created a number of diseases like disturbances in BP and nervous systems, abdominal cramps, headaches, miscarriage, anemia, bronchitis, asthma, pneumonia, heart disease, etc. Arsenic poisoning symptoms result into muscle weakness and aching; skin pigmentation in eye lid, nipples, chest and axilla; liver enlargement and kidney dysfunction. Noise pollution creates breathing and vision problems, apart from affecting physical and mental well-being. Because of the growing level of pollution, infectious diseases like diarrhoea, JE, meningitis, visceral leishmaniasis (kala-azar), viral hepatitis, malaria and parasitic infestations have been affecting public health and killing people each year. However, on account of the paucity of data in this field it is difficult to estimate the actual number of people affected or killed from various diseases.

The environmental health programme did not get adequate attention despite its need for better public health. The MoH could have played a key role as in many other countries in coordinating environmental health activities by facilitating one window system. But because of the lack of expertise and some other constraints at the MoH, the environmental health activities were diversified. Accordingly various components of environmental health have been implemented through different line ministries and agencies considering the expertise of the institutions in respective fields. However, until the national level focal institution is established, the Environmental Health Unit in NHRC could be developed as a body to work as a focal point in environmental health sector and it should be strengthened through training, staffing, logistic and other needed support. The recommended Action Plan for Environmental Health Management is given below:

Recommended Action Plan for Environment Health Management

Recommended Action Plan	Responsible Institutions	Time Frame
1. **Policies, Guidelines and Standards**		
• Development of National Environmental Health Policy	NHRC/MoH	Short Term
• Development of Guidelines and Standards on air, water, noise and soil pollution as well as food safety and occupational health	NHRC/MoH/MoPE	Continuous
• Enhance the level of awareness among the stakeholders of the benefit of environmental health management	NHRC/MoH/MoPE	Short Term
• Effective enforcement of existing environmental rules, regulations, guidelines & standards	MoPE/MoH	Immediate
• Research on strengthening inter-agency level coordination in environmental health sector	NHRC/Donor Agencies	Immediate
2. **Health and Environmental Pollution**		
• Baseline data to be generated in aspects related to environmental health.	NHRC/Donor Agencies	Short Term
• Environmental Pollution Monitoring Mechanism should be developed to monitor: Air, Water, Soil and Noise Pollution.	MoPE	Continuous
• Pesticide poisoning database should be created to assess the magnitude of the problem.	MoH/MoAC	Continuous
• Assessment of health impact of : ➢ Ambient air pollution in urban areas ➢ Indoor air pollution in rural areas including ETS ➢ Industrial and household wastewater	NHRC/Donor Agencies	Short Term

➢ Municipal and hospital waste management system ➢ Waste handlers including scavengers ➢ Excreta disposal in rural and urban areas ➢ Pesticide use and disposal ➢ Noise level in urban areas ➢ Food quality in eating establishments		
3. **Changing Environment and Diseases** • Researches on environmental health risk assessment of disease pattern specially on water borne and vector borne diseases • Cardiovascular problem in light of air pollution • Study on prevalence of arsenicosis	NHRC/MoH/Donor Agencies	Continuous
4. **National Infrastructure for Health and Environment** • Priority to be given towards streamlining all environmental health programmes through one window • Establishment and strengthening of national focal point for environmental health • Inter-Institutional (Ministries / Departments/ Divisions) coordination to be enhanced for the integration of environment health policies and programs and other related activities	MoH/Donor Agencies MoH/Donor Agencies NHRC/MoH/MoPE	Long Term Long Term Continuous

Chapter One

INTRODUCTION

1.1 Background

The sum of all physical, chemical and social factors, which compose the surroundings of man is referred as environment and each element of these surrounding constitutes resources. Environment can be defined as the interaction between human activities and its impact on the nature and culture. The components of the environment is changed or disturbed through the dynamic interdependencies. When one component of this relationship is changed or disturbed, the influence is manifested in other part of the environment. Thus, the environmental problems can be caused by natural events or by man-made decisions with the utilization of natural resources. The natural events cannot be managed but they can be minimized. However, environmental problems caused by human activities can be usually avoided through proper planning and consideration of environmental impacts.

There exists a direct relationship between human health and the surrounding environment. Unplanned urban settlement, industrial establishment, rapid increase in vehicles and depleting forest cover together cause pollution in water, solid waste and air sectors. The over-concentration of economic opportunities in urban centres further aggravate the environmental problems. The pollution in the environment directly affects the human health in terms of mortality and morbidity. Consequently, there is loss in workers' contributions and increase in their medical bills. Environmental health, thus, incorporates environmental factors that adversely affect health.

The importance of environmental health has been realized late in developing countries like Nepal as compared to the developed countries. Since health and environment issues are largely interdependent, problems related to water and sanitation, air quality control, hazardous waste management, food safety, chemical safety, noise reduction, road safety, accident prevention and hygiene promotion need to be addressed in an integrated manner.

In Nepal, the environmental health was recognized as an issue by the government only with the emergence of Nepal Environment Action Plan (NEAP) in 1993. The increasing population, uncontrolled urbanization and haphazard migration severely affected the environment and caused health problems. There has not only been an increase in environmental pollution but also the level of certain pollutants has exceeded the international standards. The bio-diversity is affected to such an

extent that several species have become extinct and the lives of many others are endangered.

The unplanned urban settlement and the higher rate of growth of population of Kathmandu Valley (5.6 per cent) and other urban areas have aggravated the air, water and land pollution. Haphazard growth of industries without adequate means of filtering the air and discharged water has contaminated the air, water and land. Use of unnecessary fertilizers and pesticides by the farmers has also created problem. Of all the pollutants, vehicular emission, solid waste mismanagement and wastewater disposal are the major factors responsible for the environmental degradation especially in Kathmandu Valley. Consequently, the health of the people in Kathmandu Valley and other parts of Nepal have been affected.

However, it is only in the recent years that certain efforts have been made by the government, NGOs, INGOs and some donor agencies to raise awareness in the society in regard to the impact of environmental degradation on health. In view of this development, it was realized that environmental health situation be analyzed to develop appropriate national plan of action.

1.2 Objectives of the Study

The overall objective of the study is to analyze the environmental health situation in Nepal. Specific objectives of the study are to:

- Identify existing policies, standards and guidelines on environment and health;
- Review the health and environment status ;
- Discuss the impacts of changing environment on health;
- Assess the existing infrastructure and capabilities of environment and health institutions ; and
- Prepare a plan of action on health-and-environment addressing intersectoral issues.

1.3 Methodology

In order to achieve the objectives and obtain the major outcomes of the study, both the secondary and primary source materials have been used for data collection. A variety of techniques have been developed for gathering such data.

1.3.1 Secondary Source Information

In the process of collecting secondary source materials, all available literature on the subject matter of the study was gathered from Nepal Health Research Council (NHRC), NGOs, INGOs, DWSS, WHO, UNICEF, Ministry of Health (MoH), Ministry of Agriculture and Cooperatives (MoAC), Ministry of Population and

Environment (MoPE), Ministry of Industry (MoI), Ministry of Forest (MoF), Ministry of Physical Planning and Works (MoPPW), National Planning Commission (NPC), International Centre for Integrated Mountain Development (ICIMOD), The World Conservation Union (IUCN), etc. Additionally, published and unpublished reports on health and environment were also collected from the related research institutions and were reviewed. Articles published in leading newspapers of Nepal were also consulted.

1.3.2 Primary Source Information

The primary source data have been collected through interview with the key resource persons and from field visits.

Interview

The key resource persons were interviewed and their views were shared on issues related to the impacts of changing environment on health and the recent trends in newly emerging diseases, including cardio-vascular diseases and respiratory diseases. Over and above, the issues like the national infrastructure for health and environment and institutional capability of the governmental and non-governmental institutions have also been discussed. The list of the resource persons is given in Annex 1.

Data Analysis and Reporting

The data collected through the secondary source materials and from the field visits have been compiled, processed and analyzed. The results have been put in a tabular and graphical form to make the study report impressive.

1.4 Finalisation of Report

While preparing the report, the consultants analyzed the data collected from the secondary and primary source materials. The study is designed in a way that it would help the planners, policy makers, government and all the concerned institutions in undernstanding the present environmental health conditions of Nepal including policies, standards, guidelines on environmental health, impact of changing environment on health and infrastructure and capabilities of institutions working in environmental health sector.

1.5 Limitations of the Study

The study attempts to bring out situation analysis of environmental health sector at the national level. Yet, most the data related to environmental health sector address the problems of Kathmandu and a few urban centres of Nepal. Data on environmental health sector in the rural and other areas are inadequate. The study, therefore, is more urban biased. However, all possible efforts have been made in the study to present balanced picture in environmental health sector at the national level. There was also a problem in establishing co-relation between environment and health sectors as most of the studies treat environment and health as independent variables.

Chapter Two

ENVIRONMENT AND HEALTH POLICIES, GUIDELINES AND STANDARDS

2.1 Background

In June 1992, the United Nations Conference on Environment and Development (UNCED) was held in Rio de Janeiro. The outputs of the conference included a *Declaration of Principles* on environment and development and an agenda for change during the 21st century, referred to as *Agenda 21*. The *Declaration of Principles* states:

"Nations shall enact effective environmental laws and develop national law regarding liability for the victims of pollution and other environmental damage. Where they have authority, nations shall assess the environmental impact of proposed activities that are likely to have a significant adverse impact."

Agenda 21 acknowledges the dependence of human health on a healthy environment. It requires all countries to have programs to identify environmental health hazards and to reduce the risks. Principle 1 of the Rio Declaration clearly states: *"Human beings are at the center of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature."*

Agenda 21 has been used as a priority-setting tool for the policies of many international agencies and countries. In response to *Agenda 21*, His Majesty's Government of Nepal has also prepared the Nepal Environmental Policy and Action Plan (NEPAP)-1993. The NEPAP tried to address issues raised in *Agenda 21* that are of particular relevance to Nepal: it identifies major environmental problems facing Nepal, briefly reviews the causes and consequences of these problems, and recommends practical policy guidelines and actions to address them.

The environmental health was recognized as an issue by the government after the introduction of NEPAP. Thereafter, many guidelines, including National Environmental Impact Assessment Guideline (1993) and sectoral guidelines were

developed. The application of these guidelines in the development sectors is commendable as it can minimize or control the adverse environmental effects. With the establishment of the new ministry, MoPE in September 1996, an Environmental Protection Act came into existence. This facilitated the formulation of many policies, guidelines and standards covering different aspects of environment. In the health sector, the Health Policy developed by the MoH in 1991 accorded priority to preventive health measures mainly in the rural areas. But on account of the lack of integrated approach in the policies and programmes of MoPE and MoH, the environmental health issues were treated more as independent rather than inter-dependent issues.

2.2 Environmental Policy

It was for the first time in the Sixth Five-Year Plan (1980-85) that the environmental problem was recognized as a national issue. Environment was regarded as an integral part of development in the Seventh Five-Year Plan (1985-90). Following the political change in 1990, the Constitution of the Kingdom of Nepal (1991) recognized environment protection as an issue of national priority for the state. The basic objectives of the government's environmental policy (EPC, 1993) are:

* *To manage efficiently and sustainably natural and physical resources;*
* *To balance development efforts and environmental conservation for sustainable fulfillment of the basic needs of the people;*
* *To safeguard national heritage;*
* *To mitigate the adverse environmental impacts of development projects and human actions; and*
* *To integrate environment and development through appropriate institutions, adequate legislation and economic incentives, and sufficient public resources;*

The environmental impact assessment (EIA) was accorded greater importance in the Eighth Five Year-Plan (1992-97). Subsequently, the Environment Protection Act (EPA 1996) and Environment Protection Rules (1997) were enacted. In accordance with EPA, a number of sectoral plans incorporating environmental components were developed. EPA also empowered the government to give continuity to Environmental Protection Council (EPC), which was established in October 1992.

In the Ninth Five-Year Plan (1997-2002), the participatory programmes involving women and under-privileged people was accorded priority. Additionally, focus was given to the growth of standards of living of the rural people, public

awareness and environmental health programmes with a view to appraise the people of preventive health service and minimize the adverse impact of environmental pollution on health (NPC, 1998).

2.3 Health Policy

In Nepal, the planners and policy makers became concerned about the health problem only at the end of the Rana regime in 1951 (Jha, 1994). The health sector was accorded priority in the First Five-Year Plan in 1956 with the establishment of MoH. The Fifteen-Year Long Term Health Plan (1976-1992) was introduced in the country in 1976 for promoting physical, mental and social health of the people. In 1991, HMG/N came out with National Health Policy and accorded priority to the development of preventive, curative and promotional health services in the rural areas. The policy also laid emphasis for the improvement of management in the health institutions at the district, regional and national levels. The role and importance of NGOs, INGOs, bilateral and multilateral agencies were visualized in supplementing government's efforts to provide health services to the people. The major components of Nepal's health policy are:

- Preventive and curative health services;
- Basic Primary Health Services;
- Ayurvedic and some other traditional health services;
- Community participation and resource mobilization in the health sector;
- Participation of private, non-governmental health services and intersectoral coordination in health sector.

As envisaged in the health policy 1991, the sub-health post and Primary Health Care Centre were established in each constituency and Village Development Committees (VDCs). Because of the improvement in the health service delivery system, 41.41 per cent of the household families in 1996 had access to nearest health institution within a walking distance of half-an-hour (NPC, 1998). As a result, there has been a significant growth in the health service delivery system in Nepal.

Under the major framework of its objectives, the Ninth Plan realized the importance of environmental health as one of its health programme activities. Accordingly, thrust was given to programmes related to environmental education, self-disposal of one's own garbage, fertilizer preparation from the garbage by the VDCs and municipalities, and street cleaning. Need for launching various environmental health programmes was felt considering the negative impact of water, air and noise pollution created by higher rate of growth of population, haphazard urbanization and migration pressure (NPC, 1998). The Second Twenty-Year National Health Plan (1997-2017) was formulated to give thrust to "preparation of periodic and annual plan, guidelines, and formulation of strategy, programmes and plan of actions based on national health needs and priority and

co-ordination among governmental, non-governmental and donor agencies" (NPC, 1998, p. 654).

2.4 Coordinating Environment and Health Policies

In fact, the environmental threats to human health are many, which may broadly be categorized as `traditional hazards' and `modern hazards.' The traditional hazards associated with insufficient development include all such aspects as the lack of access to safe drinking-water, inadequate basic sanitation at the household and community level, indoor air pollution from cooking and heating using biomass fuel and inadequate solid waste disposal. But the modern hazards are related to the lack of health and environment safeguards like pollution from populated areas, industry and intensive agriculture, air pollution from motor cars, coal power stations and industry, climate change, stratospheric ozone depletion and transboundary pollution. The changing pattern of environmental health hazards from `traditional' to `modern' with time and the economic development is also called `risk transition.'

In Nepal's environmental policy, the need for environmental health programmes was felt to appraise the people of preventive health service and minimize the adverse impact of environmental pollution. The health policy also recognized the importance of environmental health programmes like environmental education to offset the negative impact on the public health from the water, air and noise pollution.

Because the MoPE's environmental policy has environmental health as one of its components, the policy and programmes of MoH could incorporate the MoPE's policy related to environmental health. Similar other agencies of HMG/N involved in activities associated with environmental health of the people like the MoI responsible for the establishment of industries affecting air, water, land and noise pollution; MoAC responsible for the use of pesticides and insecticides and control storing, transportation of food handling and production; MoPPW responsible for the supply of drinking water and provision of safe sewerage and sanitation facilities for the urban and rural areas and municipalities; District Development Committees (DDCs) and VDCs responsible for monitoring and control of proper food hygiene and its handling on sale in the markets, tea stalls, restaurants, hotels, and street food vendors might have been benefited in case the MoH and its concerned division on Environmental Health were involved or consulted in the development of standards and legislation and their enforcement (Joint Government/WHO Evaluation on Environmental Health of Nepal). All such activities not only help them monitor and control environmental health hazards but also maintain environmental quality of the country in a far better way.

2.5 Environmental Health Guidelines and Standards

The Constitution of the Kingdom of Nepal (1990) clearly mentions that the state shall accord priority to protecting the environment and take special measures for preventing further damage due to physical development activities. On this basis, various Acts, Rules and Regulations on environmental issues were evolved during nineties. Environmental Protection Act (1996) and Environmental Protection Rules (1997) came into existence to regulate and control pollution levels in the country. The MoPE is empowered through these Acts to prohibit the use of any matter, fuel, equipment, or plant that has or is likely to have adverse effects on the environment. In this context, the National Environmental Impact Assessment Guidelines (1993), which came even before the Environmental Protection Act (1996), has made certain contribution specifically towards the protection of public health. Some sectoral guidelines have been developed, but they do not include issues or topics in specific manner for the Health Impact Assessment.

Apart from this, many documents like Constitution, Acts, Rules and Regulations give certain directions and guidelines covering various environmental and health issues. However, the guidelines developed so far like the EIA Guideline do not specifically mentions environmental health issues. An example of practice of an EIA guidelines is given in Box 2.1.

Box 2.1

A Case Study: EIA of a Hydroelectric Project

The EIA report for Middle Marsyangdi Hydroelectric Project has been prepared within the framework of EIA guidelines 1993. The report basically describes the technical characteristics of the project, then some aspects of the environmental context, particularly the biological parameters and physical set-up. In socio-economic context, the report describes briefly the agriculture and trade practices of the area and identifies the sectors where the proposed project is likely to be located. The likely environmental impacts of project implementation have been analyzed for biophysical, social and cultural aspects. At the end, conclusion has been drawn and several recommendations made.

However, a very limited information regarding current health status of project area is given. It is mentioned that the general health status in the project-affected area is not satisfactory. The main health problems are reported to be ARI, diarrhoea, dysentery, eye and ear related problems, asthma, typhoid, bronchitis, vitamin A deficiency, anaemia and a few cases of malaria. Some negative health impacts due to air, water and noise pollution due to construction phase activity have been reported. But the impacts mentioned are very general in nature. The other health concern raised in the report is the influx of population and emerging STDs in the project area. Similarly, a possibility of incidence of malaria disease increment due to suitable breeding ground for mosquitoes in the reservoir has been mentioned. Chances of increase in accidents due to increase in the construction related vehicular traffic and construction works of diverse nature are suggested. Only a few general measures are recommended, which do not seem adequate for mitigating health impacts.

Source: Final Report-EIA Study (Middle Marsyangdi Hydroelectric Project), NEA, 2001.

In the environmental sector, the following guidelines and standards have already been introduced and some are under the progress.

- **National Environmental Impact Assessment (EIA) Guidelines 1993:** Sectoral guidelines for the forestry, industry, and EIA guidelines for other infrastructure development works have been developed.

- **Air Quality Standards**: Determination of standards for Ambient and Indoor Air quality is under study at NHRC and also under MoPE. It is learned that there has been duplication of works due to the lack of clear-cut policy.

- **Nepal Vehicle Mass Emission Standards (1999)**, similar to the European Union Standards (EURO-1), have been introduced in the Valley and is in the process of implementation in other major cities.

- **Water Quality Standards:** Formulation of Water Quality Standards by Department of Water Supply and Sanitation & MoPE is under progress.

- **Effluent Standards:** Formulation of effluent Standards under MoPE in collaboration with Ministry of Industry, Commerce and Supplies (MoICS) is under progress.

- **National Ambient Noise Quality Standards:** Formulation of National Ambient Noise Quality Standards by MoPE is under progress.

2.6 Conclusion

The main challenge in environment and health sectors is the lack of COORDINATED APPROACH to address the problem and the difficulty in the implementation of related legislations and commitments that the country has made nationally and internationally. The Environmental Health Guidelines or Standards on specific issues integrating environment and health related with air, water and soil pollution are almost non-existent. Policies, guidelines and standards on environment and health sectors are yet to be developed in an integrated manner. Hence, the MoPE and MoH could work in close coordination and develop common strategy towards developing policies, guidelines and standards. The issues like food safety, chemical safety, hospital waste management, municipal waste management, excreta disposal and noise pollution are of utmost importance for the development of guidelines and standards in order to take care of environmental health problems in Nepal.

Chapter Three

STATUS OF HEALTH AND ENVIRONMENTAL POLLUTION

3.1 Health Status

Population explosion, deteriorating environmental conditions and resource constraints to tackle the key environmental health problems has affected human health and the health of the ecosystem. Planners and policy makers in Nepal are more concerned today than ever in the past about the deteriorating environmental health issues related to water and sanitation, solid and hazardous waste disposal, outdoor and indoor air pollution, soil, water and noise pollution, food safety, chemical safety, etc.

Environmental pollution adversely affects health of the people and the ecosystem. Air pollution causes respiratory problems like asthma and bronchitis. Some studies have shown certain co-relation between the pollution level and diseases like acute respiratory infections, lung cancer, cardiovascular disease, cataracts and tuberculosis. Throat and skin allergies are caused by dust pollution in the air. The *smog ozone* in the air causes irritation to lung membranes and affects the resistance capacity of heart (Adhikari, 1998). Polluted water causes typhoid, cholera, diarrhoea, hepatitis and gastro-intestinal diseases. Such diseases as Japanese Encephalitis (JE), meningitis, visceral leishmaniasis (kala-azar), viral hepatitis, malaria and parasitic infection are also the results of environmental pollution.

Because of the above problems, the mortality rate from diarrhoea was 12 per 100,000 population and morbidity 612 per 100,000 population. Similarly, 500 to 700 cases of JE occurs in the country each year. Causality due to meningitis goes to 700 cases. Annual incidence rate of the Kala-azar disease varies from 1.5 per 100,000 population to 21 per 100,000 population. Nearly 10 to 15 per cent of the deaths among the pregnant women are caused by hepatitis (Bista, 2001). Of the 108, 161 blood slides examined in 1998-1999, 7 per cent cases were detected as malaria positive (DoHS, 1999-2000). In Kathmandu Valley and its surroundings, 57 per cent of the sample cases were recorded positive for helminth egg (Rai & et al, 2000). Besides, the exposure to high level of noise not only affects the hearing power but it also leads to insomnia, ulcers and hypertension.

3.2 Health Determinant Factors

In the Nepalese context, the major health determinant factors include infant mortality rate, child mortality rate, total fertility rate, average life expectancy, maternal mortality, etc. As shown in table 3.1, the infant mortality rate is expected to decline from 74.7/1000 in 1996/97 to 61.5 at the end of the Ninth Plan (2002) and to 34.4 in 2017. Similarly, the child mortality rate per 1000 population is estimated to decline to 62.5 years in 2017 from 118 in 1996/97. Average life expectancy of the people is estimated to increase from 56.1 years in 1996/97 to 68.7 in 2017.

Table No. 3.1 Health Determinants in Nepal

Categories	1996/97	Target of Ninth Plan (1999-2002)	Target for 20 Years (1997-2017)
Infant Mortality Rate/1000	74.7	61.5	34.4
Child Mortality Rate/1000	118	102.3	62.5
Total Fertility Rate/per woman	4.58	4.2	3.05
Average Life Expectancy/years	56.1	59.7	68.7
Maternal Mortality Rate/10000	47.5	40.0	25.0
Crude Birth Rate/1000	35.4	33.1	26.6
Crude Mortality Rate/1000	11.5	9.6	6.0

Source: The Ninth Plan (1997-2002)

3.3 Natural Resources and Biodiversity

Nepal is very rich in natural resources and biodiversity. Forest, water and mines are the major natural resources in the country. But the population explosion, unplanned urbanization, industrial pollution, natural calamities are some of the major factors responsible for the degradation of forest and the loss of biodiversity.

3.3.1 Forest

HMG/N considers forest as its prime natural resource. There has been a famous slogan 'hariyo ban nepalko dhan' i.e. 'green forest is the prime asset of Nepal'. However, the forest coverage has been declining at an alarming rate. For example, in 1999 the forest and shrub areas accounted for 39.6 per cent of the country's total area (DFRS, 1999). While the hill forest and shrub land constitute about 381,000 ha; the Siwaliks in the Terai have the largest density of forest covering about 843,000 ha of land. The forest in the Terai is more productive and relatively more accessible than that in other areas. It also fulfills major demand for timber and fuelwood for all towns and cities in Nepal. Table 3.2 shows forest coverage in different physiographic regions of Nepal.

Table 3.2: Per Capita Forest Area in Different Physiographic Region

Physiographic Region	Area	Population ('000) '91	Forest area per 100 ha	Per capita forest area
Mountain	3,507.8	1,442.3	3.37	0.08
Hill	7,203.2	8,413.4	33.80	0.29
Terai	4,007.1	8,635.3	29.86	0.14
Total/Average	14,718.1	18,491.0	29.0	0.23

Source: DFRS (1999); CBS (1998)

DFRS (1999) shows that the shrub area in relation to the forest area has increased since 1978, which indicates deterioration in the quality of forest. The total stem volume and area of accessible forest in Nepal are about 387.5 million m^3 and 2179.3 thousand hectares, respectively. Table 3.3 shows that the consumption of fuelwood increased continuously since 1980. The domestic sector consumed more fuelwood than the industrial sector. The forest has also been used for infrastructural development activities such as roads, schools, public places, institutional buildings and so on.

Table 3.3: Fuelwood Consumption by Sector

Year	Total Fuelwood ('000 toe')	% of fuelwood consumption	
		Industry	Domestic*
1980	3382	0.6	99.4
1985	4361	1.9	98.1
1990	4816	1.3	98.7
1995	5408	1.9	98.1
1998	5769	1.5	98.5

Source: WECS (1998); MOF (1999)

* Domestic sector also includes commercial consumption, toe = tonne of oil equivalent

However, the growing stock of the forests depleted in all three physiographic regions. In 1985/86, the total growing stock was 522 million m^3 (MPFS, 1998). DFRS (1999b) estimated that the stock declined to 387.5 million m^3 in 1999. Another conspicuous impact of deforestation is on the flora and fauna. Various plant species have been threatened as result of deforestation and increasing pressure in their uses. Deforestation is the major cause of natural disaster like landslides, soil erosion, floods, declining productivity and sedimentation in downstream areas (Zimsky, 1999). The floods and landslides as a result of deforestation not only degrades land but also affects human lives and property. Table 3.4 depicts the effects of floods and landslides in the country.

Table 3.4: Effects of Floods and Landslides

Year	Death of Persons	Total Financial loss* (US$ 000)	Degraded land area (ha)
1984	363	2,050	1,240
1988	328	341,223	-
1989	680	90,760	-
1990	307	1,502	1,130
1991	93	494	280
1992	71	252	140
1993	1,336	99,110	5,580
1994	49	1,192	390
1995	-	-	41,870
1996	258	208,787	7,793
1997	78	1,649	-
1998	273	28,854	-

Source: MOHA (1999); DPTC (1997

* Includes loss of livestock, agricultural land, house, roads, etc

3.3.2 Biodiversity

Because of varied ecological settings, Nepal possesses some of the most spectacular biodiversity in the world. Covering a land area of only 0.1 percent of the world's total land, the country has 136 ecosystems each associated with flora and fauna. The country is home to 75 types of vegetation, 35 types of forests, 6500 of the world's flowering plants (2 percent of world diversity), 1500 species of fungus, 350 species of lichens, and 4500 species of insects. Among them, 641 are butterflies, 844 birds, 160 amphibians and reptiles, and 181 types of mammals (MoPE, 1998). Thus, the country stands to be twenty-fifth in the world in terms of biodiversity richness.

In 1998, the biodiversity in Nepal was conserved through 8 national parks, 3 wildlife reserves, 4 conservation areas, 1 wildlife reserve watershed conservation areas and 1 hunting reserve. Some of the national parks like the Langtang National Park, the Royal Bardiya National Park and the Royal Chitwan National Park have buffer zones of 420 km^2, 327 km^2, and 750 km^2 respectively apart from the protected area. Statistics show that the protected areas form nearly 17 per cent of the total land area of the country (SoE, 2001).

Nepal has a very wide variety of plant species in relation to its area coverage. Table 3.5 gives details of the different types of species and Nepal's share in the world.

Table 3.5: Nepal's Share in Global Plant Species

Groups	Nepal		World Species	Nepal's share (%)
	Species	Endemic sp.		
	Non-Flowering Plants			
Algae	687	13	40,000	1.72
Fungi	1,822	150	70,000	2.38
Lichen	471	48	17,000	2.77
Bryophytes	853	37	14,000	6.09
Pteridophytes	383	NK	12,000	3.19
Non-Flowering total	4,216	248	153,000	2.76
Flowering Plants	5,833	246	250,000	2.33

Source: DPR (1996)
NK – not known

Whereas Nepal's share of non-flowering species account for less than 3 per cent of world's total; the flowering plant species form over 2 per cent. In Nepal, 60 non-endemic and 47 endemic plant species are threatened (Shrestha and Joshi, 1996). The endemic species of plants are common mostly in the Himalayan region. Among the 60 non-endemic plant species, 22 are rare, 12 endangered, and 11 vulnerable. Similarly, among the endemic plants, 8 are extinct, 1 endangered, 7 vulnerable, and 31 in rare species' category (SoE, 2001).

Also available in Nepal are wide variety of domesticated plants. There are over 400 species of agro-horticultural crops and nearly 200 species of vegetables (NAA 1995). In order to protect plants, Nepal Agricultural Research Council (NARC) stored 8,400 germplasm of various crops such as cereals, grain, legumes, oilseeds, vegetables, and spice species. Additionally, there are about 680 accessions for rice and 713 for finger miller.

In the field of animal diversity, Nepal is very rich. The country shares 4.27 per cent of the world's total mammals (table 3.6). It is important to note that the number of endangered species such as rhino shot up from 80 in the late 1960s to about 600 in the late 1990s.

Table 3.6: Nepal's Share in Global Animal Diversity

Groups	Nepal		World Species	Nepal's share (%)
	Species	Endemic sp.		
Arthropods				
Insects	5,052	4	1,000,000	0.44
Butterflies	656	29	NK	NK
Moths	789	NK	NK	NK
Spiders	144	108	NK	NK
Pteridophytes	185	8	85,000	0.21
Herpetofauna				
Amphibians	43	9	4,000	1.07
Reptiles	100	2	6,500	1.53
Birds	847	2	9,881	8.57
Mammals	185	1	4,327	4.27

Source: MOPE (2000); Thapa (1997)
NK = Not known

3.3.3 Land

In Nepal, the depletion of natural resources, including the land degradation, is a matter of concern. All such factors as the ecological fragility, overuse of marginal lands, overgrazing, high population density mainly in the hills and mountain aggravated the problem of land degradation. Each year 240 million cubic meters of soil loss occurs in the country on account of some of these factors. It is estimated that each year soil losses account for 5-10 tons per hectare on well-managed land to 40-200 tons per hectare on degraded land. (UN System, 1999). As a result, each year the riverbeds have been rising at an alarming level by 15-30 centimetres in the Terai region of Nepal.

It is not the quantity of land loss alone but also its quality deterioration that is disturbing. As much as 1.8 million tons of plant nutrients (N, P_2O_5, K_2O and Ca) is lost each year. There is also a loss of secondary nutrients (S, Mg), micronutrients (Cu, Fe, Mn, Zn, B and Mo) and several other valuable organic substances. Annual plant nutrient deficit accounts for 84 per cent. Only 16 per cent of the fertility loss is replenished by organic and mineral fertilizers. Thus, fertility of land has been affected and agricultural productivity has severely gone down in hills, mountain and in the Terai. Besides, the problems in all such sectors as hydropower, flooding and irrigation system have become aggravated (UN System, 1999).

3.3 Environmental Pollution

The major environmental pollution related to air, water and soil is well recognized. The main causes of such pollution have been identified in several studies. An attempt has been made below to discuss some of these issues.

3.4.1 Air Pollution

Air pollution is an emerging issue specifically in urban areas of Nepal. The classic air pollutants – SO_2, NO_2, CO, TSP and lead are briefly discussed with respect to their health effects in Nepalese situation. Particular emphasis is given to TSP and PM_{10} in outdoor environment; and biomass burning and Environmental Tobacco Smoking (ETS) in indoor environment.

Ambient Air Pollution

The first monitoring of ambient air quality dates back to 1980. Most of the studies in the past have been conducted for Kathmandu Valley. The data available are from occasional studies, and therefore, methodology of monitoring and assessment might differ from one study to the other. In 1993, the Department of Housing and Urban Development (DHUD) conducted 24 hours monitoring for TSP, PM_{10}, SO_2, NO_2, CO and for lead content in the air of Kathmandu. The concentration of SO_2, NO_2 and CO were reported to be much lower than the WHO permissible limit while the concentration of TSP ranged from 182 $\mu g / m^3$ to 555 $\mu g / m^3$ and PM_{10} ranged from 59 $\mu g / m^3$ to 127 $\mu g / m^3$ in the city. The study also shows the roadside level of TSP as 2258 $\mu g / m^3$ and PM_{10} concentration of about 498 $\mu g / m^3$.

Another study conducted by ENPHO in 1993 shows 24-hour average concentration of TSP and PM_{10} as 308 $\mu g / m^3$ and 89 $\mu g / m^3$ respectively. In 1999, Nepal Environmental and Scientific Services (NESS) found concentration level of SO_2, NO_2, CO and of lead within WHO guideline's permissible limit. The concentration of TSP and PM_{10} in the city were reported to be higher by a factor of 3 when compared with WHO guideline values of 120 $\mu g / m^3$ and 70 $\mu g / m^3$ respectively.

In 2000, CCON Pvt. Ltd. and GE Consultant performed 8 hours monitoring, which shows the concentration of SO_2 in Pokhara, Birgunj and Biratnagar in the range of 26.06-34.75 $\mu g / m^3$, 34.75-69.51 $\mu g / m^3$ and 30.62 -65.17 $\mu g / m^3$ and NO_2 in the range of 20.32-25.4 $\mu g / m^3$, 6.6-12.7 $\mu g / m^3$ and 7.6- 64.78 $\mu g / m^3$ respectively. The concentration of carbon monoxide was not detected in the ambient air. But TSP in Pokhara, Birgunj and Biratnagar ranged from 134 to 201 $\mu g / m^3$, 254 to 1522 $\mu g / m^3$ and 227 $\mu g / m^3$ to 578 $\mu g / m^3$; and PM_{10} ranged from 22 to 565 $\mu g / m^3$, 188 to 676 and 170 to 506 $\mu g / m^3$ respectively. The study conducted in nine major urban cities by LEADERS Nepal (2001) found mean values of PM_{10} and TSP and the ratios of PM_{10} to TSP in many cities exceeded 0.9 (Figure 3.2), which indicates that 90 per cent of TSP is due to PM_{10}.

The other parameters of concern for ambient air quality like carbon monoxide, nitrogen dioxide, sulfur dioxide and lead in the air of Kathmandu Valley as well as in the air of above mentioned cities outside the valley are still at lower level

and are well within the permissible limit of WHO guideline value as shown in table 3.7 and 3.8.

Table 3.7: Concentration of Different Gaseous Pollutants in Kathmandu Valley

Gaseous Pollutant	NO_2	SO_2	CO	Pb
Mean Values in µg/ m^3(Averaging Time : 24 hrs)	27	26	1878	0.27(PM_{10})
Mean Values in µg/ m^3 (Averaging time: 8 hrs)	40	36	<11000	0.53
Mean Values in µg/ m^3(Averaging Time : 5 minutes (spot monitoring)	195	286	8788	-

Source: NHRC/NESS, 2001

Table 3.8: Concentration of Different Gaseous Pollutants in Major Urban Areas

Place	NO_2 µg/m^3	SO_2 µg/m^3	CO µg/ m^3	Pb µg/m^3
Pokhara	14 (PM_{10})	34 (14)	1646 (4)	0.07 (4)
Birgung	17 (6)	68 (6)	2242 (6)	0.18 (6)
Biratnagar	18 (PM_{10})	42 (PM_{10})	3724 (4)	0.08 (PM_{10})
Janakpur	20 (3)	72 (3)	603 (3)	0.82 (3)
Narayanghat	17 (3)	81 (3)	1574 (4)	0.11 (3)
Butwal	23 (13)	133 (3)	773 (4)	0.16 (3)
Bhairahawa	21 (3)	PM_{10}7 (3)	1274 (4)	0.26 (3)
Nepalgunj	16 (3)	68 (3)	1613 (4)	0.35 (3)
Mahendranagar	20 (3)	60 (3)	257 (2)	0.43 (3)
Mean for all cities	18 (48)	74 (48)	1523 (39)	0.27 (45)

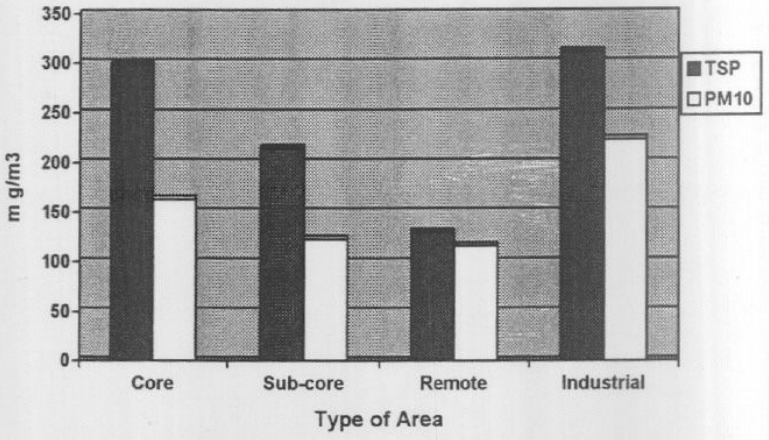
Source: NHRC/ NESS,2001
Note: Figure given in parenthesis is the no. of the data taken for mean calculation

A recent study (NHRC/ NESS, 2001) found that mass concentration of TSP and PM_{10} exceeded 300 µg / m^3 and 200 µg / m^3 in industrial areas and approaching 300 µg / m^3 and 150 µg / m^3 in core areas respectively (Figure 3.1). The concentration of these constituents can be found much higher in the vicinity of point sources like Himal Cement Factory (See Box 3.1). A similar study was conducted by ENPHO (2000) in two areas of high traffic density, which also brings similar findings. Such situation is not very common in other part of the world. For example, the TSP level exceeded 300 µg / m^3 only in some cities of China and India (WHO Air Quality Guidelines, 1999).

The higher value of Total Suspended Particulate (TSP) is harmful for public health as the TSP level exceeding 350 µg / m^3 has shown an increased respiratory symptoms. Some previous studies have also shown concern for the increased level of TSP for its effects on pulmonary function (WHO Guideline, 2000).

Among the important parameters of concern like particulate matter, carbon monoxide, carbon dioxide, sulphur dioxide, nitrous oxide and lead, some have even exceeded the WHO permissible limit of exposure specifically in the Kathmandu Valley. Of late, public attention has also been focused on the air

Figure 3.1: Twenty four hour average mass concentration of TSP and PM10



pollution in urban surroundings, which is presented in Box 3.1.

Box 3.1

Himal Cement's Emissions Dangerous to Health

The Himal Cement Factory at Chobhar near Kirtipur in the Kathmandu Valley has attracted considerable public attention for its dust emissions which at times can be seen from any point in the Valley. Commissioned in 1974, the company has expanded its production capacity from 160 to 400 tones of clinker per day. Limestone required for this factory comes from the limestone deposits in the Chobhar hills. Industrial Service Centre (ISC) reported that the emission from the cement kiln before the factory's expansion contained various gaseous compounds, including NO (200 ppm), NO_2 (30 ppm), and SO_2 (5 ppm). Carbon dioxide (CO_2) formed 16 per cent of the flue gas and CO, 2.6 per cent.

Himal Cement's two vertical shaft kilns and a rotary kiln together produced five to six tones of dust every 24 hours. Of this, about 1.25 tones were particles less than 10 mm in size, and as such can remain suspended in the air. Such smaller sized particles are responsible for many respiratory diseases. A reconnaissance survey of the area surrounding the factory revealed very heavy dustfall within a 300 m radius from the base of the stack. Depending on the wind conditions, Chobhar village near the factory and Sanga village across the Bagmati river were enveloped in dust. Everything near the factory was covered with dust and looked whitish grey. The lack of adequate dust collectors was cited as the reason for high dust emission.

According to some observers Himal Cement's silica dust, ash and smoke do not remain restricted to the immediate environs and villages, but spread in a thin haze throughout the valley. These emissions have affected the health of the factory workers as well as inhabitants of the surrounding villages.

Source: Report on Joint Government/WHO Evaluation on Environmental Health of Nepal.

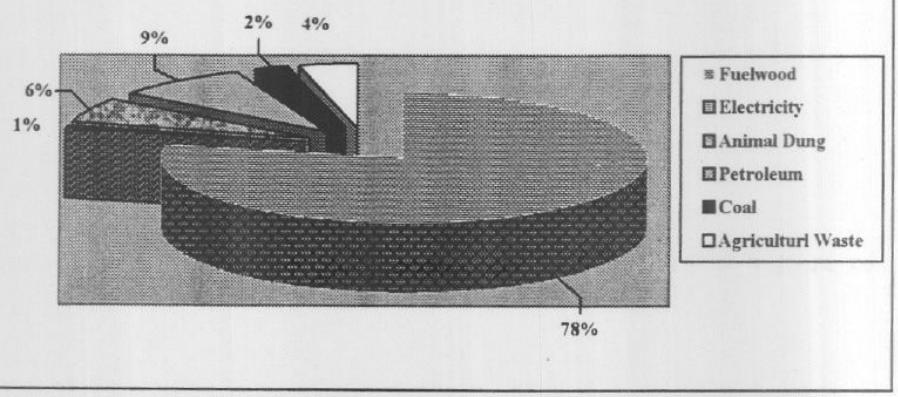
Thus, the increased level of TSP matters has become issue of serious concern for an air quality issue. The increased air pollution could be a consequence of rapid growth in the number of motor vehicles, poor conditions of roads, inferior quality of automobile engines, adulterated fuel products and the emission from the factories. Likewise, the lack of dust/smoke control mechanism in construction, industrial and household activities also contribute to air pollution.

Indoor Air Pollution

Information on indoor air quality is very limited. A recent study (NHRC/ NESS, 2001) indicates PM_{10} concentration for cooking place as 8207 μg / m^3 where biomass (wood) is burnt and 3414 μg / m^3 and 1504 μg / m^3 at the places where kerosene and LPG are used as fuel respectively. Davidson et. al. (1986) conducted a study for eighteen houses in Nepalese villages (Sundarijal and Bhadrabas) and found the concentration level of 8800 μg / m^3 of TSP, 21 ppm of CO and 368 ppb of N_2O where biomass (wood) was used as fuel.

Another study conducted by Pandey et. al. in 1987 have also reported the similar situation of indoor pollution for the houses burning biomass as fuel. The study shows concentration of CO as 82.5 ppm and formaldehyde (HCHO) as 1.4 ppm. A study in one urban and three rural areas of Nepal in 1988 (Pandey et. al.) recorded a very high prevalence rate of chronic bronchitis and *cor pulmonale*. The study suggested that the high prevalence of chronic bronchitis was primarily due to their exposure to domestic smoke while cooking. The use of biomass as fuel is very common. Statistics show that about 90 per cent of total households still use biomass as fuel (WECS,1998).The rural population depends mainly on firewood to their energy demand. The use of other traditional sources of energy like animal dung and agricultural residue are also in practice. The percentage share of energy by type is given in figure 3.2.

Figure 3.2: Types of Energy Consumption for Cooking



Thus, women and children are exposed to high levels of indoor air pollution. The other studies have shown the consistent evidence that indoor air pollution increases the risk of chronic obstructive pulmonary disease and of acute respiratory infections in childhood, which is most important cause of death among children under 5 years of age in developing countries. Similarly, low birth weight, increased infant and perinatal mortality, pulmonary tuberculosis, nasopharyngeal and laryngeal cancer, cataract, and specifically in use of coal with lung cancer have shown the correlation with indoor air pollution (Nigel et. al., 2000).

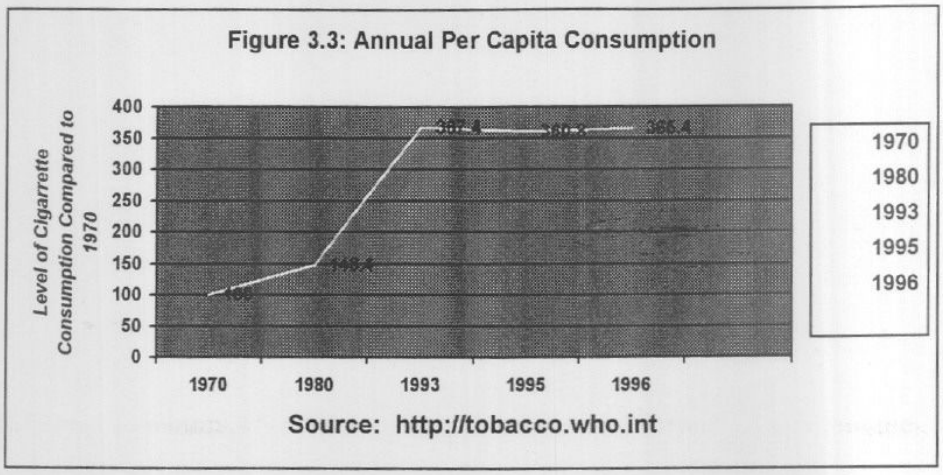
Tobacco Smoking

Tobacco smoke is a fresh biomass smoke. In the form ETS, it is associated with adverse health impacts in adults and children at particular concentration (WHO Guideline, 2000). The tobacco smoking in the form of cigarettes, *bidi, hukkah,* and *sulpa* is common in Nepal. In general, urban people smoke cigarettes while rural people smoke *bidi, hukkah* and *sulpa.* But the recent trend shows that people are getting more and more addicted to cigarette smoking because of the growing accessibility to cigarette (table 3.9). The study conducted by Pandey et. al (1988) in two villages indicates that more than two thirds of sampled population were smokers. Since the non-smokers breathe in the same toxic chemicals in tobacco smoke as the smokers do, they are also affected.

Table 3.9: Annual Cigarette Consumption

Year	Per capita Consumption (Cigarette sticks)	Total Consumption (sticks in Million)
1970	172	1135
1980	224	1851
1989	645	6706
1995	615	7496
1997	619	7992

Source: (http://tobacco.who.int, September 2001)



The figure 3.3 denotes that the consumption of cigarette is growing alarmingly in Nepal. The annual per capita consumption of cigarette increased to 148.4 level in 1980 as compared to the base year 1970 (100). There has been spectacular growth in the cigarette consumption between 1980 and 1993 from 148.4 to 367.4 , but it almost stabilized in the subsequent years (365.4). Cigarette consumption in the country also increased owing to the fact that a large number people switched over from the traditional *bidi, hooka and sulpa* smoking to cigarette. The table 3.9 shows the annual cigarette consumption which has not taken into consideration of traditional smoking agents like *bidi, hukkah,* and *sulpa.* The table 3.10 shows the mortality of Nepalese people which must have accounted the deaths caused by ETS.

Table 3.10: World age-standardized mortality rate per 100,000 Population

Disease	Male		Female		Age
	Number	**Rate**	**Number**	**Rate**	**Category**
Trachea, lung, and bronchus cancer	**559**	**40.5**	**113**	**8.3**	**45+**
Lip, Oral, cavity, and Pharynx cancer	**663**	**47.8**	**270**	**19.3**	**45+**

Source: (http://tobacco.who.int), Sep 2001 -Ferlay, J. Parkin, D.M, & Pisani, P. (1998). GLOBOCAN 1: cancer incidence and Mortality Worldwide. [International Agency for Research on Cancer.]

The smoke contains several toxic chemicals, including benzene, cyanide, cadmium, lead, radioactive polonium, benzo(a)pyrene, ammonia, carbon monoxide, and nicotine. Therefore, the ETS or second-hand smoke is a serious concern for causing indoor air pollution. It is reported that ETS causes 3,000 lung cancer deaths and 15 times more deaths from heart disease every year in the USA (http://tobacco.who.int, September, 2001).

3.4.2 Water Pollution

Water pollution can be caused by various anthrapogenic activities and natural events. As human health is directly related with water quality, its degradation can affect human health considerably. Increased water pollution is one of the major public health issues in Nepal. Diseases caused by contaminated water are among most prevalent diseases in Nepal (DoHS, 1998). Water-related diseases account for highest share of the total OPD visits, of which diarrhoeal and skin diseases constitute 10 per cent and 42 per cent respectively (DoHS, 1999). The status of surface water quality and groundwater quality with respect to health effects are discussed in following sections.

Surface Water Quality

The anthrapogenic activities have shown serious concern in polluting surface water as there exist some traditional practices of disposing all sorts of domestic waste into the river. Specifically, the disposal of nightsoil and solid wastes in nearby open places, surface drains, yard and on the bank of the river has been common practice in Nepal. None of the cities in Nepal except Bhaktpur has sewerage facilities and wastewater treatment system. The wastewater treatment system of Bhaktpur is also not very satisfactory, the municipal wastewater treatment plants constructed in Hanumanghat and Sallaghrri of Bhaktpur is operating inefficiently. The other two treatment plants constructed in Dhobighat and Kodku for Kathmandu and Lalitpur are also not in function.

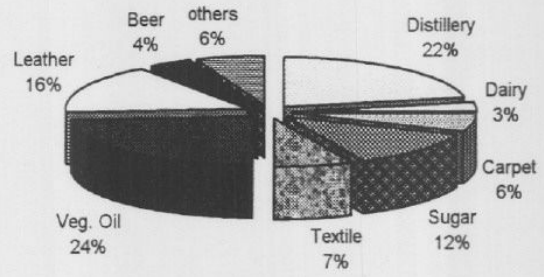
The existing on-site systems (OSS) are septic tank and pit latrine. There does not exist safe disposal of OSS content even in Kathmandu Valley (Yadav, 1995). The existing domestic sewers also discharge directly into the rivers without any treatment. Both in the urban and in rural areas, many people defecate on open ground, often along the banks of ponds, rivers and streams. In the cities of Kathmandu Valley, only 15 per cent of the houses have access to a sewerage facility (NWSC, 1999). On an average, 20,846 kg of BOD per day is available at the outlet of the Bagmati River, constituting 42 per cent of the total BOD load produced by the valley's people (CEMAT, 2000). Apart from this, municipal solid waste disposal at the bank of the river is very common and even the bank of Bishnumati is utilized as disposal site for municipal waste in Kathmandu Valley. Thus, the discharge of household wastes including excreta and solid wastes have shown severe effects on quality of river water passing through the settlements.

Industrial Census of 1991/92 (CBS) shows that the total industrial wastewater discharge of 8.557 million cubic meter contains 5.7 thousand tons of BOD and 9.6 thousand tons of TSS. Industries causing water pollution constituted 40 per cent of the total 4,271 industrial establishments in the country in 1991/92. In 1991, IUCN identified 125 industrial plants throughout the country as polluting 'Hot Spots'. Of them, sixty highly polluting hot spots included industries like;

- Brewery and distillery,
- Cement,
- Cigarette and tobacco,
- Feed,
- Iron and steel,
- Rosin and turpentine,
- Soap and chemical solvent,
- Oil and vegetable ghee,
- Jute,
- 'Kattha' (a cacia catedu),
- Leather and tanning,
- Marble and magnesite quarry,
- Paper and pulp,
- Sugar and 'khandsari' (raw sugar paste), and
- Textile industries.

Industrial pollution in terms of wastewater volume, biological oxygen demand (BOD), and total suspended solid (TSS) loads of the effluents; the major polluting industries are related to vegetable oil, distillery, and leather industries (Devkota and Neupane, 1994). The percentage share of different types of polluting industries are shown in the Figure 3.4.

Figure 3.4:Type of Polluting Industies and their Percentage Share



Kathmandu valley hosts more than 72 per cent of the country's water polluting industries. Many of these industries discharge effluents into local rivers without treatments, spoiling the quality of river water. The study by Devkota and Neupane (1994) indicates that the contributions of industrial effluents to the rivers are about seven per cent of the total effluents (domestic and industrial) in the Kathmandu Valley. In one recent study conducted by Asia Foundation (2001), it

was found that the service industries like motor workshop has been polluting both the surface and ground water (Box 3.2).

Box 3.2

Motor Workshops' Discharge

The narrow thoroughfares of the ancient urban area of Kathmandu were never designed for the heavy traffic of motor vehicles that now ply the streets - trucks, buses, tempos, cars, and motorcycle, running on poor quality diesel and petroleum fuel, emitting toxic fumes and, all too often, visible black clouds of smoke. A corresponding form of pollution, less visible, yet highly damaging to the environment , comes from the 1,000 motor repair workshops now registered in Nepal's capital city. There, liquid and solid wastes such as used fuels, lubricants, used parts and accessories, and auto batteries are haphazardly discarded, including an estimated 460,000 liters of kerosene per year. The toxic liquid wasters leach into subsoil, or washes into streams and rivers.

The toxic wastes of motor repair workshops are not so obvious as other forms of pollution, not in a city where black smoke belches from vehicle exhausts, and a cement factory fetches 2.4 tons of toxic chemicals into the air . But the cumulative damage from Kathmandu's estimated 1,000 motor repair shops, and an estimated 9,000 more scattered throughout Nepal, is a serious factor in the country's rising rates of cancer and other pollution-related illnesses. The physical infrastructure at most motor repair workshops is poor, the environmental awareness almost non-existent, and wastes are constantly mishandled.

A common daily chore, cleaning engine parts in bowls of kerosene, is one of the most profound, yet least known, forms of pollution in developing countries. Once the job is finished, most workers dispose of the used kerosene just as if it were dirty water. They pour it on the ground. In Kathmandu, that sends an estimated 46,000 liters of toxic kerosene into the soil and ultimately the water supply each year.

Another everyday job at motor repair workshops, spray painting, sends the clouds of toxic paint vapor into the air, threatening worker health and contaminating the surrounding air. Each shop is also a graveyard for discarded parts- including used batteries containing toxic acids, and carbide ash, a by-product of welding.

Source: Asia Foundation, 2001

Some of the industries have treatment plants, but they are discharging effluents without considering any effluent standards. Some of them provide primary treatment and discharges into nearest water source (Box 3.3). Some of the industries treat wastewater in their own anaerobic digester. They do not take care of their wastewater until they are opposed by public which of course indicates very poor enforcement of rules and regulations.

Box 3.3

A Case Study: Pollution in Bara and Parsa Districts

Leather factories in Bara Parsa district cause water and land pollution. While tanning the leather, chromium metal is invariably used for the purification purposes. Considering the fact that the discharge water of the leather tanning is polluting, a central unit was developed at Parbanipur in Bara district in cooperation with UNIDO. Accordingly, the water discharge of all the leather factories is brought to the central unit through the tanker for treatment. The water flows to Sirsiya river after treatment. But the job is too complex. In actual practice, the owners of leather factories are not interested in treatment because of the complexities involved in the system. The owners are interested in treating the discharge water to the extent that the chromium used in the purification process is recovered but such untreated water goes to the river. It is not only the leather factories that pollute the water of Sirsiya river, but also almost all the major industries are situated along the river in Bara and Parsa districts, including Birgunj Sugar Factory, pollute the water. The Birgunj Sugar Factory does have a treatment plant but it does not function.

The water of Sirsiya river becomes so polluted that even a person does not touch it. The polluted water of the river kills birds and animals and it also affects the agricultural production and productivity. Consumption of tubewell water around the riverside is also harmful for human health. People in the surrounding of the river find it difficult to breathe because of the bad smell coming out of the river water. The pollution in the river does not appear to be a problem during the rainy season as the untreated water from different industries is easily washed away. But the problem gets worse in the post-rainy season when the water level of the river considerably goes down.

In Parsa district, air pollution is also a problem. Since the district is the gateway to Nepal, each day thousands of vehicles pass through the district emitting poisonous gases harmful for the health. Rickshaws and vehicles also create noise pollution. Because of the lack of landfill sites, Birgunj Municipality dumps household wastes and the hospital wastes haphazardly near the Birgunj Custom office and along the by-pass road close to the Birgunj Bus Park (See the pictures).

Lack of the awareness on the part of the workers is the main problem in occupational safety. Because of the smokes and other pollution-related problems in the factory surroundings, the health of many of the workers is affected. For example, Jyoti Spinning Mill, one of the major industries in Parsa district, does not encourage the workers to make effective use of masks for their protection. So the soots are inhaled causing major health problems. Like the management of the Jyoti Spinning Mill, management of many other factories are also least interested in the health problems of workers. Condition of the workers in the Saw Mills and Asian Paints is also worse. But not all the stories are pessimistic. Industries like Colgate, Surya Tobacco and Dabur have maintained better environment in their respective units for the occupational safety of the workers.

The water quality of major rivers and lakes across the country is within acceptable standard except the rivers and lakes in the vicinity of the settlements and nearby factories. The satisfactory level of water quality may be due to their high dilution ratio and limited human interference. But due to deterioration of watersheds and gullies as a result of deforestation and cultivation of slopping areas, the problem

with regard to landslides, soil erosion, and floods have been aggravated and it has led to the increment of turbidity. The water quality parameters of major rivers are given in table 3.11.

Table 3.11: Water Quality of Major Rivers in the Dry Season

Name of Rivers/Regions	pH	TDS (mg/l)	DO (mg/l)	BOD (mg/l)
Mahakali at Panches/Far West	8.8	110	5.0	2.0
Karnali at Chisapani /Far West	8.9	264	10.5	1.5
Bheri at Chatgaon/Mid West	7.8	208	9.3	1.1
Seti at Ramghat/ West	8.2	222	9.3	2.0
Rapti at Sauraha/ Central	7.8	213	8.7	2.5
Arun/ East	6.5	200	9.1	2.1
Kankai/ East	7.7	60	8.7	2.0
Mechi/ East	8.3	30	8.9	1.8

Source: CBS (1998) DHM(1999), DO = Dissolved Oxygen,
BOD = Biological Oxygen Demand, TDS = Total Dissolved Solids.

The time series data with respect to water quality parameters of one of the rivers called Rapti River is shown in Table 3.12. The average nutrient level recorded shows the concentration of nutrients within the permissible level for river water quality. However, the nutrient level is due to the run off from agricultural lands, though the average use of chemical fertilizers is still within the lowest pre set level of use in South Asia (Basnyat, 1999).

Table 3.12: Water Quality of the Rapti River at Pindighat (central Terai)

Constituents	1995	1996	1997	1998
Turbidity, NTU	15	67	64	116
Ammonia, mg/1-N	110	225	370	125
Nitrate, mg/1-N	125	60	40	20
Nitrite, mg/1-N	2	16	3	4
Phosphate, mg/1-P	147	136	130	30

Source: CEMAT (1999)
NTU= nephelometer turbidity unit

All the four lakes, including Begnas and Rupa in the Pokhara Valley, have high level of nutrients (eutrophic condition). As shown in Table 3.13, Phewa has poor quality of water. Gosainkund, which is located in the remote area north of the Kathmandu Valley, shows better quality of water as there is limited human interference and virtually no contamination by sewage or run off from agricultural activities.

Table 3.13: Water Quality of Selected Lakes, Nepal

Parameters	Phewa	Begnas	Rupa	Gosainkund
BOD, mg/1	2.0	2.0	2.68	NK
TN, Hg/1	0.12	0.1	0.1	0.2
N-NO3 mg/1	260	233.6	176.4	210.0
TN,hg/1	45.0	43.5	59.6	8.6
P-PO4 Hg/1	30.0	18.7	23.3	3
Chlorophyll a, hg/1	8.0	5.5	6.5	1.2
E. coli/100ml	8.0	28.9	393.3	NK

Source: ENPHO (1998), COSMOS (2000)
NK = Not known

Groundwater Quality

The groundwater quality in the Kathmandu Valley is contaminated as none of the groundwater source, such as dug-wells, deep tubewells, stone spouts, ponds, and piped water, is free from faecal contamination. Bacteriological water quality of Kathmandu Valley is given in table 3.14. In a study (ENPHO, 2000) to determine the level of nitrate in ground water, the results showed that the concentration of ammonia-N even in deep wells exceeds WHO standards. Similarly, nitrate-N concentration is also higher in shallow and dug wells. This nitrate-N contamination could be attributed to both human activities and natural occurrings. The comments on the drinking water quality of Kathmandu Valley as published in the national daily the Kathmandu Post are given in Box 3.4.

Table 3.14: Bacteriological water quality from different sources, Kathmandu Valley

Faecal coliform /100ml	Value as % of sample units of 15						
	Dug Well	Shallow Well	Deep well	Spring	Stone Spout	Pond	Piped water *
0	0	60	80	40	20	0	60
1-100	40	30	15	30	40	0	20
101-1000	30	5	5	30	40	0	20
>1000	30	5	0	0	0	100	0

Source: ENPHO, 1999; NWSC, 1999

Box 3.4

Contamination of Water in Kathmandu Valley

Experts say around 80 per cent of the urban residents in the Valley have bore tube-wells in their compounds as Nepal Water Supply Corporation (NWSC) cannot meet the need of the inhabitants. Such wells may draw seepage of wastewater from the surrounding underground environment.

Shushila Regmi, a chemist at Groundwater Resources Development Project (GRDP) says the ground water of all the parts of the Kathmandu Valley has been contaminated to undrinkable extent and the quality of water is decreasing day by day. People say they are compelled to dig wells even without the official nod as their needs are not fulfilled. According to official estimates, the water demand of the Kathmandu Valley is above 150 million litres per day. But the NWSC provides only 80 to 130 million litres in the Valley, leaving the residents to arrange the rest of their need by boring tube-wells.

A survey was done in June 1995 on the contamination of drinking water by the government which found that the faecal element was nil in the water of the Manahara River. But now, lab test traced 3,200 colonies of faecal element per 100 ml of water from the same source, according to a study done by Melamchi Water Supply Development Board in November 2000.

"The change of surface water quality directly affects the ground water. We can't say groundwater of one place is better than another now. Even the water collected from Sundarijal is proved contaminated," Regmi adds. Sundarijal is the prime drinking water source of the Kathmandu Valley from where it is distributed to consumers through pipelines. Some areas have damaged drainage and the human waste also mixes into the ground water. Further, some groundwater receives input from the rivers which are also equally contaminated. The water from such wells are not only contaminated but also can cause serious damage to the environment too.

Source: The Kathmandu Post, May 2001.

Groundwater is the main source of drinking water in the Terai region of Nepal. ENPHO carried out water quality tests at seven sites. It was confirmed that the water was not free from coliform bacteria at many sites. It was also found that the concentration of iron and manganese are above the level of WHO standards (Table 3.15). The increased level of iron and manganese indicates the geological formation with iron and manganese content within aquafiers. In Parsa, E-coli test was conducted by Nepal Red Cross Society between Paush 10, 2057 to Asadh 1, 2058 in all of the tubewells' water that were installed. Of the 1691 tubewells tested, the water of 283 tubewells was found pathogenic[1].

[1] Based on information from DWSO

Table 3.15: Water Quality of Shallow Groundwater Aquifers in the Terai

Sites (District)	Chloride (mg/1)	Ammonia N(mg/l)	Nitrate-N (mg/l)	Iron (mg/l)	Manganese (mg/l)	Coliform (cfu/100 ml)
Panchgacachi (Jhapa)	15.4	0.70	0.2	6.0		11.1
Baijnathpur (Morang)	16.4	0.50	0.2	4.5	0.5	15.9
Bayarban (Morang)	17.6	0.50	2.4	6.0	0.6	0.0
Takuwa (Morang)	21.0	1.00	1.0	10.4	0.4	45.9
Shreepur, Jabdi (Sunsari)	37.2	0.90	0.2	8.0	0.6	25.5
Bandipur (Sirha)	195.6	0.70	3.5	0.4	0.4	0.0
Naktiraipur (Saptari)	54.5	1.20	0.3	12.0	1.3	16.0
WHO standard	250.0	1.24	10	3.0	0.5	Nil

Source: ENPHO ,1990

Recently, contamination of groundwater with Arsenic has been noticed in Parsa District of central region, Morang of eastern region and in Nawalparasi of Western region. It indicates arsenic content in geological formations, which might increase the level in future. Study report indicated that the arsenic contamination far exceeded the WHO standard of 0.01 mg/l (provisional value) or the 0.05 mg/l set for a few developing countries like Bangladesh. In Lakhanpur VDC of Parsa district, the arsenic level was found to be as high as 0.456[2] mg/l, which is nine times higher than the recommended value for some of the developing countries. As reported by the concerned bodies, arsenic contamination in the water was found in tubewells between 150 ft. and 200 ft. in the district. A relevant story published by the Kathmandu Post about arsenic contamination is given in Box 3.5.

[2] Based on interview with Mr. Ram Chandra Sah, DWSO, Birgunj

Box 3.5

Arsenic contamination in ground water in Terai

Evidence of arsenic contamination in ground water, which was detected in neighboring Bangladesh and West Bengal state of India in the past decade, has also been found in the southern plains of Nepal, causing health hazards to those drinking well water contaminated with the chemical that can cause cancer in the long run.

A study carried out by the government's Department of Drinking Water and Sewerage (DWSS) in conjunction with the Environment and Public Health Organization (ENPHO), a governmental organization, has found "excessive concentrations" of arsenic in ground water samples taken from shallow tube-wells mainly in the districts of Rautahat, Parsa, Nawalparasi, Banke and Bardia.

While tube-well water samples collected from the districts of Jhapa, Saptari, Sarlahi, Bara, Rupandehi and Kapilvastu districts were found contaminated with arsenic over the maximum permissible level (0.01 mg/lit) set by the World Health Organization, the concentrations were found well beyond the Bangladesh and India recommended level (of 0.05mg/lit) in Rautahat, Parsa, Nawalparasi, Banke and Bardia.

Nawalparasi topped the other districts with 191 per cent of the 432 samples showing arsenic poisoning beyond the WHO recommended level and 41 per cent showing contamination beyond the Bangladesh and India standard. Maximum concentration of arsenic was detected at 0.205 there, which is several times the WHO and Bangladesh standards.

"We found symptoms of arsenic poisoning – such as hyperpigmentation, desquamation, scaling and corns – in 3.1 per cent of the people who consumed arsenic-contaminated water regularly for five years," Dr. Mathura Shrestha said. The symptoms were confirmed after samples of nails and hair of those developing skin problems were tested in Kolkata, India.

"If people with symptoms of arsenic poisoning are not treated on time and continue to drink the contaminated water for, say, 15-20 years then the disease will take the form of skin cancer." Dr. Shrestha told. "The best remedy would be to test the shallow tube-well or other well water and stop drinking it if its found contaminated with arsenic. "

"Although arsenic contamination was also detected in the districts of Jhapa, Saptari, Sarlahi, Bara, Rupandehi and Kapilvastu and several other districts of the Terai, poisoning was negligible and does not affect human health, " said Dr. Roshan Shrestha, a scientist with ENPHO, who led the research team.

Source: The Kathmandu Post, July 29, 2001

The cumulative effects of discharges from households, industries and agricultural activities, including land degradation, have a striking negative impact, particularly in the rivers flowing through the settlements. Many studies have found that the quality of the Bagmati River and its tributaries is very poor nearby settlements but it improves beyond the valley. Thus, water in Nepal is affected mainly by anthrapogenic activities and also to some extent by the process of land degradation leading to the increase of turbidity and further sediment load or mixing of minerals etc. Haphazard urbanization, inadequate sewerage facilities and discharge of domestic and industrial wastewater directly into the terrestrial

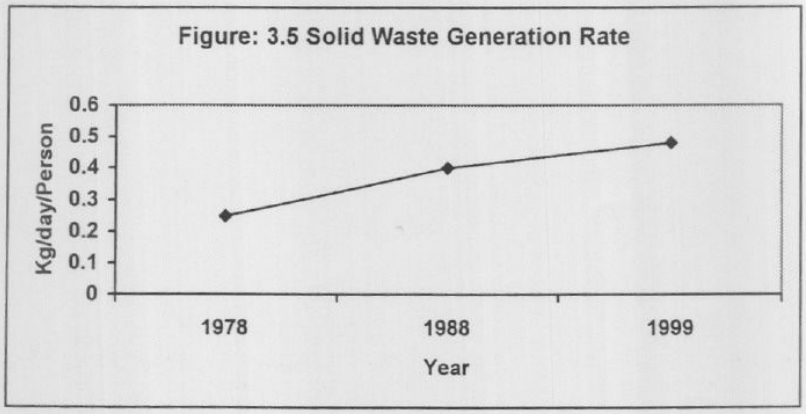
and aquatic systems without any treatment are the major causes of the increased pollution level of river system and the groundwater. Improper use of pesticides and disposal of solid wastes have also contributed to water pollution. This pollution level have perhaps contributed to the emergence of water-borne and water washed disease as the statistics show that the OPD visits due to such diseases are alarmingly high (DoHS, 2000).

3.4.3 Municipal Solid Waste

Improper management of municipal solid waste can become an environmental health hazard, especially in the context of our country where heaps of garbage are dumped along the streetside and river banks and in other public places. The Municipal Solid Waste produced by different municipalities has become problem particularly in large cities like Kathmandu, Lalitpur, Pokhara, etc. In all such municipalities, improper management of waste led to environmental pollution affecting public health. A study (Rajbhandari, 2000) on municipal sanitary workers in Kathmandu shows that people working with municipal waste and their infants and children have become prone to health hazards. However, no specific research shows that public health has been affected by improper management of solid wastes.

Nepal generates a smaller quantity of waste and most of such waste is not of hazardous nature and are easily recyclable. Many studies show that the per capita waste generation in Nepal is low as compared to most other countries, but the generation rate has shown the increasing trend due to increased level of living standard and advancement in urbanization. Figure 3.5 shows the increasing trend of generation rate of municipal solid waste at different time interval. Lohani and Thanh in 1978 estimated that the per capita waste generation rate in Kathmandu was 0.25 kg/day, GTZ in 1988 found it to be 0.4 kg/day and a recent survey estimated the average amount to be 0.48 kg/day (RESTUC 1999).

Figure: 3.5 Solid Waste Generation Rate



However, another study by Misra and Kayastha (1998) found that the per capita waste generation rate of Nepalese cities varied from 0.25 to 0.5 kg/day depending on the size of the city. The composition of waste is presented in table 3.16. Although, it shows that the share of plastics and paper in garbage is increasing, two-thirds of waste materials are still organic.

Table 3.16: Solid Waste Composition

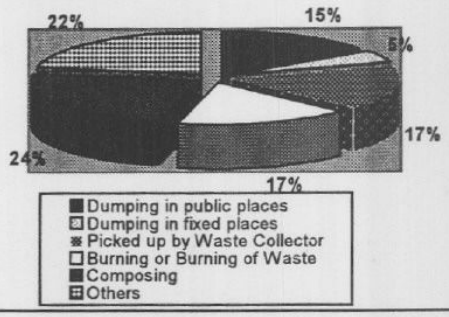
Components	% of waste (by weight)					
	1961[1]	1981[2]	1985[3]	1988[4]	1995[5]	1996[6]
Organic Materials	67.8	60.0	67.5	58.1	65.0	67.0
Paper	6.5	19.3	6.0	6.2	4.0	8.8
Plastics	0.3	3.6	2.6	2.0	5.0	11.4
Glass	1.3	3.4	4.0	1.6	1.0	1.6
Metals	4.9	3.4	2.2	0.4	1.0	0.9
Textile	6.5	5.3	2.7	2.0	3.0	3.6
Rubber and Leather	0.0	0.0	0.0	0.4	1.0	0.3
Wood	2.7	1.6	0.0	0.5	3.0	0.6
Dust/construction debris	10.0	3.4	15.0	28.9	17.0	5.3

Source : SOE, 2001

1. Mean value of two samples taken at Thamel on 30/7/76 and at Bhonsiko Street on 3/8/76 (Tabasarn 1976)
2. Tabasaran and Biodlingmaier's report on the possibility of composting municipal waste in Kathmandu Valley (Mutz 1990)
3. Survey on waste generation on households and small shops in Kathmandu and Patan (Mutz 1990)
4. Survey of waste from six sites in Kathmandu conducted in May 1988 (Mutz 1990)
5. Survey conducted by NESS (Thapa and Devkota 1999)
6. Average of samples from seven sites (RESTUC 1999)

Except Kathmandu and Bhaktapur municipalities, none of the municipalities is serious about waste management other than dumping and landfilling. A survey (1997, CBS) conducted in Kathmandu Valley indicates that most urban residents dumped their waste in public places or in fixed sites along the streets or in front of their houses. Figure 3.6 shows the methods of waste disposal at household level. Household waste generated accounts for about 83 per cent of all solid waste generated in Nepal. In comparison, agricultural waste accounts for 11 per cent and industrial waste 6 per cent of the total solid waste.

Figure 3.6 Methods of Household Waste Disposal



In case of primary collection, the waste is not at all separated at household level, only a few things which pays well at source are separated like unbroken bottles, undamaged papers and metallic things in bulk. Recyclables and the hazardous wastes are not separated even if the bulk of wastes contain them. This indicates the lack of awareness among the people about the importance of segregation. Scavengers and scrap dealers buy or collect scrap materials and sell them to factories in Nepal and in India. It is estimated (Tuladhar et. al., 1998) that approximately five percent of Kathmandu's waste materials are recycled in this manner. Many scavengers can be seen at the skip and in the streets often spilling the waste. Timilsina (2000) estimates that the average daily waste generation in metro Kathmandu is as 540 m3 /day of which 72 per cent of total waste goes for final disposal in landfill site, though 21 per cent of total waste is recyclable and 62 per cent of waste is compostable.

In Kathmandu valley, Pokhara and in Biratnagar, private sectors and NGOs partly serve door-to-door for the collection of waste. In several places, waste is deposited into the metal container and is transported by municipality or private sectors to the disposal site. But both private and municipal waste collection services are not performed well. Most of the municipalities are involved in sweeping streets and dumping the wastes along a nearby rivers or in public places. A study (NESS, 1993) reported that the collection and final disposal of waste records of Kathmandu Valley in 1992 found only 51 per cent of waste handled by municipalities and by Solid Waste Management & Resource Mobilization Centre (SWM&RMC). The rest of the waste was disposed off improperly causing adverse environmental effects even at the time the landfill site was under operation.

The waste management history of Nepal indicates that there was only one, Gokarna landfill site, developed with the help of GTZ to dispose the waste of Kathmandu valley. Even this was not environmentally safe because it did not have liners and leachate collection and treatment system for leachate. The Gokarna landfill site is already full. The SWM&RMC is responsible for developing a new landfill site, which is yet to be identified. The selection of new

landfill site has become very complex due to NIMBY (Not In My Back Yard) syndrome among the people. In the absence of proper landfill site in Kathmandu Valley, the waste generated in Kathmandu Metropolitan City and Lalitpur Sub-Metropolitan City, is dumped and compacted with soil cover along the bank of Bagmati and Bishnumati rivers with a view to developing road along rivers' corridor.

However, Bhaktpur Municipality owns a small compost plant with processing capacity of four tones of waste per day. But due to the poor management and marketing of compost, it is currently processing less than one tone of waste per day. Kathmandu Metropolitan City (KMC) is operating a few small compost plants and it has made contract with the private sector to develop the composting plant with large capacity. Other municipalities throughout the countries do not have waste disposal system. In general, they remove the heaps of waste dumped along streetside or in public places occasionally, transport it with the help of tractors or trucks and dump into the depressions' in outskirts of city areas. If river exists nearby, they don't miss to throw into the river.

Since the disposal of waste is not very scientific, it must be causing adverse health effects. However, there is a lack of in-depth study on impacts of municipal waste on the surrounding environment and human health. One major impact of municipal waste is on the water quality of rivers and the health of the people working with waste. Besides, it also affects aesthetic value of the cities and rivers.

3.4.4 Excreta Disposal

Excreta is disposed at the household level mainly through facilities ranging from septic tank systems, pit latrine and sewerage to virtually absence of any of these facilities. In the rural areas and in the urban slums, open defecation is very common as they do not avail any sanitary facilities in most of localities.

Table 3.12 shows the percentage of population having access to latrine in different time periods. Even in the cities of Kathmandu valley, only 15 per cent of the houses have access to a sewerage facility (NWSC, 1999). The excreta from the households connected with sewerage facilities are finally disposed off into the nearby rivers and streams. Also, the nightsoil desludged from OSS are thrown into the river. None of the cities in Nepal has proper disposal system of excreta. Hence, the haphazard disposal of excreta/nightsoil is polluting the groundwater, surface water and the soil.

Nepal Family Health Survey (NFHS), based on a sample survey of households, indicates that 21 percent of total population had access to safe latrines in 1990, which increased to 24 per cent in 1996 (table 3.17).

Table 3.17 Percentage of households with access to latrine

	1990			1996		
Access to Latrines	Rural	Urban	Total	Rural	Urban	Total
Nepal Liv. Stands. Survey	-	-	-	17.7	73.7	(23.8)
NFHS	16.3	69.8	19.8(21.2)	17.5	74.4	22.5 (23.6)

Source: CBS (1996) and National Family Health Survey for 1990 and 1996
Note: Figures in parentheses are estimates of weighted averages for total population.

The sanitation practice is poor in rural areas as only 17.5 per cent of the people have access to latrine. It shows that the rest of the people in the rural areas defecate on open places, which may contaminate surface water, groundwater or soil ultimately. Among the urban population, only 74.4 per cent of population have access to latrine disposing nightsoil temporarily into septic tank or into the pit. Yadav (1995) has found 84 l/capita/year of nightsoil deposition in the OSS of Kathmandu Valley, partially disposed in manhole of sewerage system and finally leading to the nearest river.

Due to the poor sanitation practices, the surface and ground water quality have been affected. For example, the Bagmati River and its tributaries are polluted by excreta disposal. They have been converted into almost open sewerage for wastewater disposal. Various studies conducted in the past have found their pollution level tremendously high, for which disposal of household waste including excreta being the major factor. Almost all the parameters, including the key chemical parameters, such as DO, BOD, COD, nitrate, phosphate and coliforms are considerably higher in the water. Thus, the water quality of the Bagmati River and its tributaries is very poor inside the valley and improves beyond the valley where additional freshwater streams mix with the main river (Pradhan, 1998 and CEMAT, 1999).

The level of bacteriological contamination in shallow groundwater in Kathmandu valley as shown in table 3.14 can be attributed to poor excreta disposal practices. Shallow groundwater is probably polluted through seepage from the widespread use of septic disposal systems, which is also likely to discharge into the rivers and streams of the valley.

The majority of the OSS in the urban areas are septic tanks which are desludged periodically depending on the storage capacity. However, the nightsoil desludged are not disposed safely. The desludging operation itself is not very hygienic, as the municipalities of Kathmandu Valley use Suction Tanker for collection and transportation of nightsoil. The desludging is done manually at most of the places by an ethnic group called *chyame* and *pode* in hill and mountain, and *Halkhor* in the Terai. There is no proper treatment and final disposal system of nightsoil. People always select cheaper method of disposal irrespective of its effects to the human health and environment. Thus, it is finally disposed in nearby open places,

surface drains, yard and the river bank (Yadav, 1995). Since there is no proper disposal and treatment system for the nightsoil throughout the country, except at few individual institutions, improper disposal of excreta is one of the major factors causing water borne and water washed diseases.

3.4.5 Noise Pollution

Not many studies have been conducted on noise pollution in Nepal. Whatever limited studies that are there have not indicated much of the problems of noise. Traffic is one of the main sources of noise pollution in urban areas of Nepal. Sapkota et. al. (1997) reported noise level of Kathmandu as given in the table 3.18. The reason for the raised noise level is due to the old and poorly maintained automobiles and inadequacy of mufflers fitted into the vehicles and use of horns. The main factors leading to noise pollution in the municipal areas are due to power tillers, buses, heavy trucks, and three-wheel tempos.

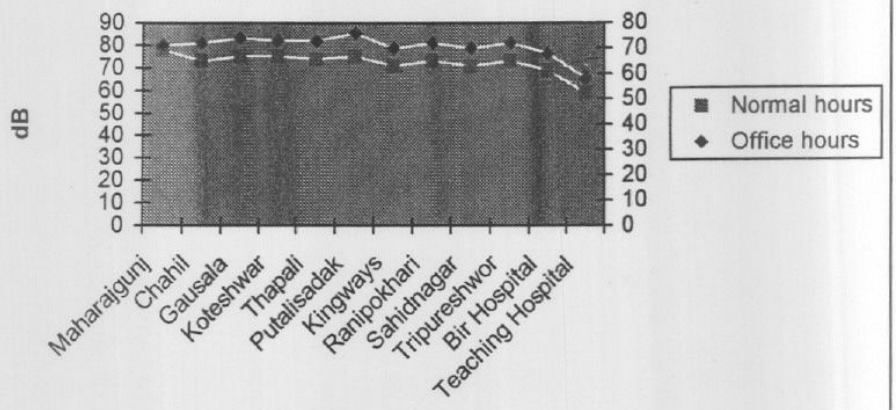
Table 3.18 Noise Level in decibel in Kathmandu

Areas	Noise Level Equipment (N leq)	Noise levels as % of samples			
		NI_{10}	NI_{50}	NI_{95}	NL_{max}
High traffic	78.97	80.97	75.34	69.04	97.11
Low traffic	75.21	78.00	71.96	64.62	94.19
Public traffic	69.67	72.00	67.04	62.34	86.82
Residential and commercial places	74.52	77.02	70.44	63.38	92.27

Source: Sapkota et al. (1997)
*Noise: Subscript values indicate sample size

Another study carried out by ENPHO (2000) at 12 sites in Kathmandu reports that the noise level in terms of exposure per day is within the tolerable limit. These values when compared to other cities are found low and have not indicated any serious problem in Kathmandu, as shown in Figure 3.7.

Figure 3.7: Noise Level at Different Locations in Kathmandu Valley



The level of noise produced by industries depends on the types of machine and resources adopted. Out of 125 industries surveyed by NECG in 1991, noise levels were found higher in textile, cement, paper, marble, iron, steel, sugar, leather, and jute industries. Similar investigation carried out by Miyoshi (1987) reported maximum values of 100 dB in some industries in Hetauda, which exceeds international safety standards. Therefore, it can be concluded that noise is also on an increase in municipal and industrial areas and has shown problem in case of specific category of industries. Though the noise pollution at the present level is not considered a big problem in Nepal except in few localities, its negative health effects have been documented in many industrialized countries.

3.4.6 Hazardous Waste

Nepal generates very little hazardous waste as compared to other countries. However, even such small amount of waste generated is not properly managed. The policy-makers and society as a whole have not taken any step to minimize the potential environment and health risks associated with such waste (SoE/ICIMOD, 2001). The main types of hazardous waste generated in the country are medical waste, pesticides, batteries, and a few types of industrial waste.

Hospital Waste

Tuladhar (1999) estimated a total of 6,521 hospital beds in Nepal generating about 500 tones of hazardous waste per year which is mixed with other garbage and is either dumped or burned in ordinary kilns. Apart from the waste generated from the hospitals, small clinics, pathological labs, pharmaceutical and pharmacies also generate some medical waste. In general, the present waste disposal practice for wastes generated from healthcare facilities is not environmentally sound, though it could be hazardous (Box 3.6).

Box 3.6

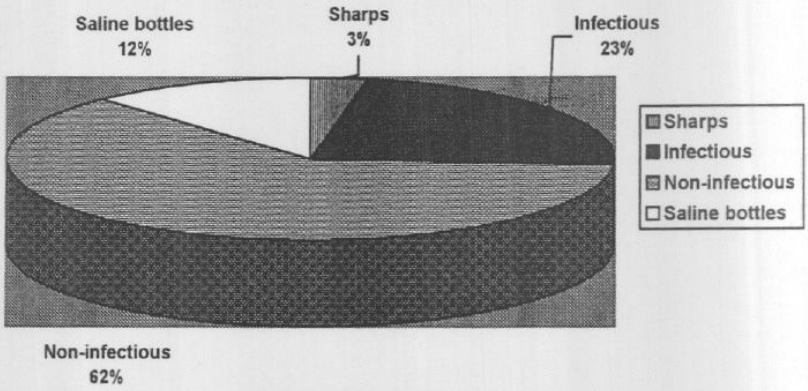
Hospital Waste Composition

Infectious: surgical dressings, swabs, cultures and stock, dialysis equipment, disposable (gowns, gloves, aprons, towels), wastes from isolation wards, etc. Sharps: needles, syringes, scalpels, blades, broken glass, etc. Pharmaceutical: Drugs and chemicals expired, spilled, soiled, contaminated, etc. Chemical: Solid, liquid or gaseous chemical from lab. Or from diagnostic, experimental, cleaning, etc. Aerosol & pressurized containers: gas containers, etc. Radioactive: Sealed source (component or instrument), Open source (for analysis of body tissue and fluid.

Source: WHO Guideline

A study by ENPHO (2000) found the composition of hospital waste generated from the health care facilities in the valley as shown in figure 3.8. It shows that only 26 per cent of the total waste is infectious, 3 per cent consists of sharps and a large portion of the waste is non-infectious in nature.

Figure 3.8: Hospital Waste Composition



Source: ENPHO, 2000

In general, hospital waste is collected in plastic bins at the point of generation. Most of healthcare institutions provide each bed with a bucket for waste disposal. But the waste collection practices indicate that covered collection is not practiced. Table 3.19 shows one of the survey outcomes about the practice of waste collection in government and private healthcare institutions.

Table 3.19: Covered and uncovered collection

Mode of Collection	Public Hospital (%)	Private Hospitals (5)
Covered bins	46	65
Uncovered bins	54	26
Not known	0	9

Source: ENPHO, 2000

In most places, the safety aspects of handling of medical waste is ignored. In many cases, sharps are segregated and other infectious wastes such as blood, urine and stool samples, and swabs are disposed in the same container. A study (ENPHO, 2000) indicates that out of eight clinics and labs surveyed, only two segregate sharps and the other two segregate infectious waste. However, waste generated from government or private health care institutions are collected, transported and disposed together with municipal solid waste, while the disposal of municipal solid waste is also not very scientific (3.4.3). Most hospitals and nursing homes rely on the municipal services for their ultimate waste disposal in addition to burning or burying within the institution premises. A few institutions like Teaching Hospital and Patan Hospital have provision of incinerators for the combustion of medical waste they produce, but unfortunately they are not properly functioning. Table 3.20 shows the segregation practice of waste by healthcare facilities. Box 3.7 also mentions segregation and storage practice of waste.

Table 3.20: Segregation of waste by healthcare institutions

Institutions	Sharps (%)	Sharps/Infectious/non-infectious (%)	Infectious/non-infectious (%)	No Separation (%)
Public Hospitals	15	23	8	54
Private Healthcare Institutions	35	17	9	39

Source,: ENPHO, 2000

BOX 3.7

Segregation Practice of Wastes

Out of 36 healthcare institutions surveyed, 28 per cent separate only sharps, 19.44 separate sharps, infectious and non-infectious, 8.33 per cent do not segregate waste at all, though the waste separation is critical in reducing the amount of hazardous waste. The overall scenario depicts that the private healthcare institutions are relatively more efficient in waste segregation as compared to the government hospitals. More than 50 per cent of the government institutions do not practice waste segregation. This can be explained on the basis of several reasons, the main cause of not practicing such waste handling technique is due to poor management, lack of hospital policies, lack of awareness and the large influx of patient in government hospitals due to minimum treatment charges. While observing the storage facilities, it was seen that none of the healthcare institutions in Kathmandu have proper storage facilities. The establishments that rely partially or fully upon the municipality services for the waste disposal, usually store waste in containers provided by the municipality. The storage period may range from a day to as long as 15 days. There are no separate rooms for storage and waste kept in the hospital or nursing home premises usually in backyard, before the municipality finally picks them up.

Source: ENPHO, 2000.

It is important for waste collector or for scavenger to take enough precaution during hospital waste handling, as there is high risk associated with handling of hospital waste. However, the study indicates that about one fourth of healthcare facilities do not provide any kind of safety measures. Some of the institutions do provide gloves and masks, whereas a few institutions also provide boots and aprons. In addition to outfits for waste handlers, only very few institutions have provision of vaccination against Hepatitis B or other immunization injections. Thus, the majority of people involved in waste handling are vulnerable to transmission of infectious diseases like HIV/ AIDS, Hepatitis-B, etc. The hospital waste management practices in Patan Hospital and also in Tribhuvan University Teaching Hospital (TUTH) are comparatively more organized in the country, which is presented in Box 3.8.

Box 3.8

Hospital Waste Management Practice

Patan Hospital manages infectious waste and sharps by itself and gives the non-hazardous waste to the municipality. It disposes food waste into the container provided by the Lalitpur Sub-Municipal Corporation, which is collected twice a week for a certain charge per trip. Needles are incinerated in the incinerator and clinical waste, which include pathological and infectious waste, burnt in the locally made kiln. Similarly, Teaching Hospital disposes general waste into the container provided by the Kathmandu Municipality. The container is collected every alternate day for a certain amount of money per trip. The rest of the 15 healthcare institutions are entirely dependent upon the municipality for the disposal of their waste. There are 6 public hospitals and 9 private healthcare institutions under this category. These healthcare institutions are either provided with containers that are collected by the concerned municipality or simply dump the waste in the roadside containers that are picked by the municipality. While most of these institutions dispose waste without any prior treatment, National Dental Hospital sterilizes and wraps the waste in plastic bags before final disposal into the municipal containers. In Om Hospital, clothes and bed sheets used by AIDS and Hepatitis-B patients are burned openly.

Source: ENPHO, 2000

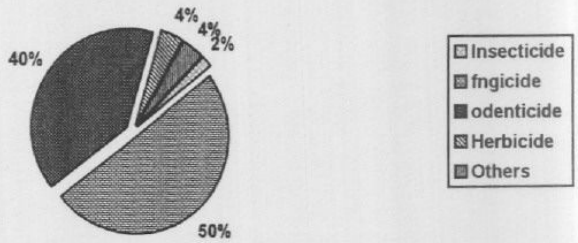
The mismanaged waste disposal practices not only affect those who are directly involved in waste handling but also to those who are living in the vicinity. Those institutions that practice burning do not have a proper burning facility. The harmful fumes resulting from both closed type of burning and open type can be a big threat to the health of the residents around such healthcare institutions, as the management or disposal of hazardous waste is not very scientific and environmentally safe.

Pesticide Pollution

In Nepal, poisonous substance, pesticides, are being used as fungicides, insecticides, rodenticides and herbicides. They are widely used for preventing, controlling, destroying, repelling and mitigating pests. Use of pesticides is common in health, agriculture, forest and manufacturing sectors (Bastola, 1998). The annual consumption of pesticides in the country exceeds 107 Mt. (active

ingredient) with major portions being used as insecticides and fungicides (Palikhe, 2000), as shown in figure 3.9.

Figure 3.9: Type of pesticide use in Nepal

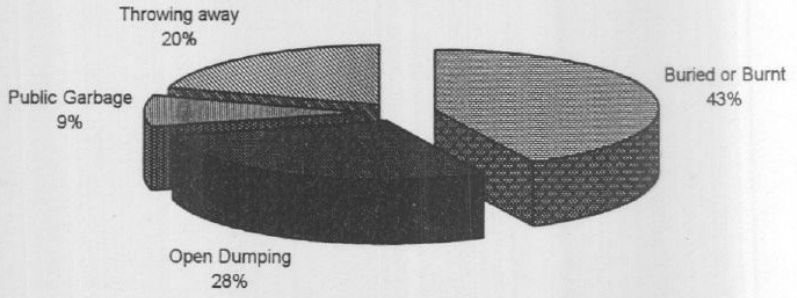


Source: Palikhe, 2000

The pesticides are widely used to control various pests and diseases, which are usually occasional and seasonal. They are used intensively in areas having easy access to markets, particularly in areas with intensive commercial farming of vegetables, fruits, cotton, tea and rice. Over the years, the pesticides application is increasing. The consumption of pesticides (commercial formulations) per unit area is estimated to be 142 gm/ha (IUCN 1995). However, no information is available on the quantity of pesticides imported into Nepal over the last 40 years. But the total quantity of obsolete pesticide stocks accumulated over this time is about 75 tonnes. Most of these stocks are held in Agricultural Input Corporation (AIC) warehouse at Amlekhgung. Pesticides are also stored in warehouses at Nepalgunj, Banke and Khumaltar, Lalitpur (The Kathmandu Post, October 17, 2001). Surplus stocks are held by other agencies such as the Cotton Development Board (CDB) and Nepal Agriculture Research Council (NARC). One of the reasons of gluts in pesticides is its purchase exceeding the level of demand. All the procured pesticides are not sold and there is a glut of date expired chemicals which ultimately became obsolete for use.

The methods most preferred by farmers for the disposal of date expired pesticides are burial, burning or simply throwing them in an open dumping space, which contaminate the ground water. Similarly, misuse or negligence in proper use of pesticides, especially during the pre-harvest interval, can create residue problem. Commonly, the farmers don't follow the pre-harvest waiting period and apply

Figure 3.10: Pesticide Disposal



Source : IUCN, 1995

pesticides near harvest time. Since the agricultural produce is consumed directly, they pose health risk to the general public. A survey carried out by IUCN on the disposal of unused/old pesticide confirmed that the disposal of such matter is not properly carried out. The figure 3.10 shows the disposal practices adopted by respondents. It is, however, more alarming to note that 41 per cent of the retailers dispose the date expired pesticides by selling them at a cheaper price. The safe disposal of unwanted, time-expired and/or damaged pesticides and empty containers is a problem in Nepal as the facilities for safe disposal and the technical know-how to accomplish this work is limited.

Pesticides accumulated over the last 25 years. In 1990, the obsolete pesticides was estimated as 150 tons. Through the efforts of AIC and Disposal Specialists (ADB/TA/1073), some 114 tons of pesticides were disposed and an estimated 36 Mt. was stored in one central warehouse in Amlekhgunj. A case study on the Pesticides at Amlekhgunj Warehouse is presented in Box 3.9; whereas the details of expired pesticide stock at AIC warehouse in Amlekhgunj is given in Annex 2.

Box 3.9

A Case Study: Expired Pesticides at Amlekhgunj

The Amlekhgunj Pesticide warehouse is in existence since 1950s. However, due to the lack of any policy about the pesticide, the government imported pesticides from different countries without taking into consideration the national needs. Therefore, the supply of the pesticides increased the demand for them. As pesticides of different categories were not used in time, it became a problem for the government as to what to do with the expired ones. Amlekhgunj warehouse is one of such units of AIC where expired and unwanted pesticides of different categories are stored.

As per the information given by Zonal AIC Office in Birgunj, the Amlekhgunj warehouse stores as many as 324 drums of expired pesticides both in liquid and dust forms. Normally, one drum contains 200 litres of pesticides. However, all the pesticides are not equally harmful to public health.

Over the years, three higher level teams of government of Nepal visited the Amlekhgunj warehouse to suggest measures for the proper management of expired pesticides. But no concrete development was there. It was also known that foreign experts visited the warehouse and tried to categorize the different groups of pesticides. But certain pesticides could not be identified.

Not knowing what to do with the expired and unwanted pesticides, some of the confused government officials tried to dump some pesticides under the ground. But the dumping of the pesticides was done in confusion. Part of the packing materials remained unearthed. It was not very difficult for the ordinary people to know that the government dumped pesticides so harmful to the environment. This created fury among certain sections of the population. The government later on bowed to public pressure and stopped dumping the pesticides.

In Nawalpur Horticultural Farm, certain expired liquid and dust pesticides were partly sprayed in open space and dumped in the ground. This activity of the government invited protests from the local people. The government again succumbed to the public pressure.

At times, it was thought that the expired pesticides could be dumped in bunker. But fearing of the impact of the earthquake on the bunker, this idea of dumping pesticides was also given up.

Because of the public pressure and protests against the spraying and dumping of the deadly pesticides, the AIC has not imported fresh pesticides in the Amlekhgunj warehouse. But it has still been importing pesticides and supplying them to the concerned units.

The organochlorine and organomercury pesticides are no longer registered for use in Nepal. They are banned in most other countries on environmental grounds. Most of the old stocks have no residual pesticide activity. In addition, they often form into solid lumps which can no longer be dissolved in water for spraying. Thus, the stock contains organochlorine compounds for which no disposal method is suitable other than high temperature incineration. This is suitable for all of the pesticides except organomercury compounds. However, such sophisticated incinerators do not exist in Nepal. Stocks also include substantial volumes of old highly toxic persistent pesticide OCs compounds, OPs & OMCs (Table 3.21)

Table – 3.21 Amount of Pesticide Wastes Stored in AIC and Other Public Sector's Offices

S.N.		OP (tons)	OC (tons)	OMC (tons)	MB	Total
1	Amlekhgunj AIC Office	8.1	35.4	7.4		50.9
2	Other AIC Office	12.93	1.543	--		14.473
3	NARC	3.879	0.155	0.727		4.761
4	CDB	3.711	--	--		3.711
	Sub Total	28.62	37.098	8.127		73.845
5					21 Cylinders	Quantity not known

Source: Palikhe 2001

AIC is only one of the several bodies importing pesticides. The only manufacturing plant situated in Bahadurgunj is reported to be closed (Box 3.10). The government allows the import of pesticides under open general licensing system. So anybody interested to import deadly pesticide is free to do so. There is no criteria whereby licence could be granted to the deserving business houses. Lack of any record of the buyers and sellers of deadly pesticides has made the matter worse. It is, therefore, not known if the pesticides imported into the country are used or misused. Environmental health impact of the misuse of the pesticide might prove dangerous.

Box 3.10

Pesticide Manufacturing Plant in Bahadurgunj

A small Nepalese – owned formulation plant (Nepal Pesticide and Chemical Pvt. Ltd.) opened in Bahadurgunj in early 1980s and operated for 3 to 4 months per year at its peak with the capacity for formulating 700 Mt of dust preparations (primarily malathion) and about 500 liters of emulsifiable concentrates (methyl parathion). Raw materials for this industry was imported from India. However, the pesticide factory at Bahadurgunj is closed. Hence, country has to depend solely on the import of pesticides from foreign countries.

Source: IUCN, 1995

For the time being, the pesticides in Amlekhgunj warehouse is not creating any major health problem for the obvious reason that they are well packed. But the problem is there and it is hanging as a sword on the head so long as it remains. But more than this problem, the implications of the haphazard import and supply of deadly pesticides in various parts of the country has been affecting public health. Because of the haphazard use of pesticides, certain animals are reported to be killed, particularly in the Terai districts of Nepal. Life of several birds and species are also threatened. Though there is no official statistics about the casualty caused by the misuse of pesticides, each year such cases frequently occur.

3.4.7 Food Safety

Nepal is one of the few countries in the world where food adulteration is posing a serious threat to the life of the people. It is creating havoc in the society, as a large number of people are its victims. Many people, particularly from the lower and middle income earning groups, fall victim of different diseases and die, though no statistical account is available to substantiate the fact.

Eating Establishments

As the Nepalese society is gradually becoming modernized, people's dependence on foodstuffs prepared on street corners, restaurants, hotels, etc. has been growing. In most of the market centres, the sweet items in the restaurants are common. Restaurants also serve Nepalese, Indian, Tibetan, Japanese, Chinese and continental dishes. Of late, the number of fast food centers and street food corners have started thriving, which *inter alia* serve wide varieties of food items, including pastries, breads, *momocha*, noodles, *samosa*, *chhole-bhature*, *pakauda*, meat boiled, fried, roasted, minced and spicy raw meat.

However, at different street corners, restaurants and small hotels the foodstuffs are prepared in most unhygienic environment close to the public toilets and garbage boxes. Such scenes are also perceptible in other parts of the country, particularly on the bus parks. Quite often, the utensils used for serving foodstuffs or liquor are either not properly washed or washed with most dirty water. Even there is no sense of personal hygiene for the persons who either cook or serve food. Besides, most of the foodstuffs are badly exposed to dust, dirt, flies and the fumes of the vehicular traffic. As if all this were not enough, the foodstuffs are also contaminated with chemicals, colour, food additives and preservatives, which are detrimental to the health of the consumers.

Food Imports

As the country is exposed to all types of imports of food items, the existing infrastructure for conducting the quality control at the custom points are awfully lacking. It was just an exception that the import of potato from the Kakarbhitta custom point was banned sometimes this year considering the hazardous nature of its quality. The said potato was banned when some people were reported to have died or affected after consuming it. Investigation later on revealed that over-use of organoclorine in the potato was the root cause of the problem.

Food Adulteration

Of the 2000 to 3000 items identified by the Department of Food Technology and Quality Control, nearly 20 per cent are either of below standard or adulterated. Among these items the adulteration is more pronounced in items like oil and ghee where there is serious violation of food safety measures. Most of the consumer

items, including vegetable oils, vegetable ghee, milk and milk products, cereal grains, spices, sweets, confectionery, tea and mineral water are contaminated, though in varying degrees.

Of the total 270 samples of mustard/rape seed oil, 28 per cent are contaminated with argemon oil, which is treated as deadly poisonous to human health. In the case of vegetable ghee, about 34.69 per cent samples are below the standard. Situation of milk is still alarming as 75 per cent of the sample-pasteurized milk is contaminated with coliform. Contamination of milk was common both in the big and small dairy plants.

Such cereal grains as *rahar dal*, *masur dal* (lentil) and black *dal* are contaminated partly due to high content of heat and fungal damaged grains and partly due to the use of colour. Furthermore, 9.37 per cent of the spices are adulterated mainly because of the use of inedible colour and crude fiber. Use of metanil yellow colour has really degraded the quality of sweets, particularly *laddu, buniya, barphi* and *nimki*. Studies show that about 8 per cent of the tea samples are adulterated on account of caffeine content.

Test conducted on certain food items indicated the presence of coliform count in several street eating establishments, restaurants and hotels. Such element as staphylococcus aureus was detected in cooked rice, cooked vegetables, milk, meat products and fishes. Some of the sample *samosa, momo* and *chaumin* were contaminated with *staphylococcus,* coliform and salmonella. Similarly, *kachilla* and *chwela* were contaminated with coliforms. At times, certain inedible stuff is mixed with the edibles, which even takes the life of the consumer. A child is reported to have met tragic death when he swallowed `plastic whistle (toy)' attached with `lolly pop' (Joshi, 2000).

Food adulteration level was only 12.85 per cent in 1992-93, which increased to 15.5 per cent in 1998-99. In 1994-95, the food adulteration level was as much as 24.7 per cent. The level of food adulteration was highest in Far-Western Region (37.9 per cent) and least in Central Region (12.6 per cent). In the Eastern Region, Mid-Western Region, Western Region and Eastern Region, the level of food adulteration was 28.5 per cent, 17.8 per cent, 13.1 per cent, respectively.

Residues of Pesticides

Certain rape leaves, spinach and fenugreek leaves are contaminated with methyl parathion and malathion. Copper sulfate is used for colouring green vegetables like cucumber and brinjal. The farmers in commercial pockets of Bara, Parsa, Dhading and other districts use pesticides much more than the recommended doze. Many of the farmers bring the vegetables, particularly the vegetable leaves to the market within a few days of spraying certain hazardous toxic elements. There is a growing concern about food safety caused by residues of fertilizers, pesticides and veterinary chemicals, microbial food borne outbreak and diseases,

heavy metal contaminants, dioxin and food packaging materials, food additives, natural toxicants and radio nuclides.

Some food items marked the presence of aflatoxin above the prescribed limit. The presence of heavy metals (Pb, Ni and Cd) above the prescribed limit in dried fish and vegetable ghee was a matter of serious concern. The level of radioactivity, on the other hand, was below the permissible level of 300Bq/Kg in 297 sample food items.

However, the Quality Control and Standardization Division of the Department of Food Technology and Quality Control has been carrying out workshops and engaging itself in activities like consumers gathering, extension and publication, poster distribution, and production of tele-films and tele-spot shows with the objective of bringing awareness among the consumers about the quality of food. An example of the health hazards of aflatoxin due to the lack of awareness among the people is given in Box 3.11. The introduction of food label with packed products giving details of list of ingredients, net contents and weights, name and address of the manufacturers, country of origin, lot identification, date of marking, date of minimum durability, etc. would enable the concerned authorities to take action against those violating food standards (Karki, 2001).

Box 3.11

Aflatoxin in Maize May Take One's Life

Maize, one of the staple foods in Nepal, is most common in the hilly region. No one could have anticipated that maize could create health problem. But the doctors have recently suspected that maize, if not dried, could lead to liver problem and prove fatal to human health.

The doctors in Bir Hospital were surprised to detect liver problem among a number of people in certain village in Dhading district. They tried their best to identify the root cause of the problem. Had there been one or two of such cases, the problem could have been ignored. But it was almost like an epidemic. This compelled the doctors to become serious about the problem.

At the end of several investigations, the doctors confirmed that the presence of aflatoxin in maize was the root cause of the liver problem among the patients. Investigations further confirmed that the cloudy weather of July-August lead to the growth of sponges mainly in the undried maize, which is the root cause of aflatoxin leading to liver problem among the human beings.

Source: Interview with Dr. T.B. Karki, Central Food Research Laboratory.

3.5 Conclusion

The environment is getting polluted day by day in almost all-important areas related to land, air, water and noise. Apart from the forest depletion, biodiversity is affected and land is degraded. In the field of air pollution, PM_{10} and TSP are on the higher side and they even exceed WHO recommended value specifically in the ambient air of Kathmandu valley. The vehicular pollution and poor road condition are major contributing factors for ambient air pollution. Similarly,

biomass burning is the most severe cause of indoor pollution. Also, indoor pollution is caused by tobacco smoking.

Surface and ground water is polluted due to improper discharge of industrial and domestic wastewater. Excreta disposal has polluted surface water and it has also shown its impact on ground water, particularly in settlement areas. Lack of treatment of industrial wastewater discharge, poor sewerage system and unsatisfactory household disposal system have contributed to water pollution. But dilution effect in the rivers has helped minimize the pollution of surface water to a great extent. The observed increase in turbidity of rivers is due to the degradation of land. The contamination of groundwater is due to mineralisation of natural formations like As, Fe, Mn etc.

Municipal waste generation, though small in quantity, has not been properly managed. Most of such waste is not of hazardous nature and are easily recyclable. Hospital waste on the other hand is hazardous in nature and it is also not properly managed even in a single hospital. This is due to poor government response and weakness of institutions at the local level.

Recently, noise pollution is on the rise especially in the urban areas. This problem is due to the rise in traffic and certain industries in particular localities.

Pesticide is being used haphazardly. Its disposal is a matter of national concern as there is a glut of expired pesticide in different warehouses. Handling of pesticide is so poor that it gets into the food chain indirectly. The adulteration in food through colours, additives and other hazardous chemicals have also affected the food safety standard.

Though no direct co-relation is found between the environmental degradation and the major diseases in Nepal, it cannot altogether be ruled out that some of the diseases like diarrhoea, JE, meningitis, visceral leishmaniasis (kala-azar), viral hepatitis, malaria, parasitic infection and insomnia, ulcers and hypertension affecting public health and killing so many people in different parts of the country are caused by environmental degradation. The public health, as a result of all these problems, is getting affected. It demands appropriate and effective measures from the planners and policy makers to control the situation.

Chapter Four

IMPACTS OF CHANGING ENVIRONMENT ON HEALTH

4.1 Background

Since the beginning of the First Five-Year Plan in 1956, numerous development works have been carried out haphazardly in various parts of the country. Consequently, several valuable natural resources have been depleted creating an imbalance in the environment. Moreover, public health has also been affected due to this degraded environment. The steep growth of diseases related to polluted environment has been realized recently by the concerned authorities in Nepal. Some of these diseases are directly co-related to the changing environment, which are discussed below:

4.2 Occupational Diseases and Injuries

Despite certain ups and downs in the Nepalese economy, the rate of economic growth recorded 6.2 per cent in 1999 and 2000 (Economic Survey, 2000-2001). With an increase in economic activities, the industrial production in 1999-2000 increased by 8.7 per cent. Though the manufacturing sector accounted for only 10 per cent of the GDP, it provides employment opportunities to sizeable labour force. Of the 11.67 million labour force in the country, 5 per cent are employed in industry, mines, power and construction and another 14 per cent in trade, hotel business, transport, communication, finance, real estate and social services sector (NPC, 1998, p. 211). The total number of employed people in industrial and mining sector was estimated to be 395,000 by the end of the Eighth Plan in 1997. Needless to mention that the largest chunk of the labour force has been engaged in the agriculture. Yet the concept of occupational health is not adequately understood. The employers are least concerned about the health hazards associated with the environment of the workers. On the other hand, the workers, too, are not so aware of such problems. In the absence of occupational health standards, the labourers working in hazardous working environment in carpet, garment, textile, stone and marble, brick, cigarette and other such factories have been falling victim to different diseases.

4.2.1 Health Status of Workers in Industrial Sector

Though at a slower pace, the country has gradually been moving from an agrarian to industrialized economy. There is a migration of labour force from agriculture to industrial and service sectors. Each year a sizeable section of the rural labour

force end up in carpet, garment and other industries. Some of these people also meet accident and injuries. Many of the girls and women trafficked to urban centres fall victims to HIV/AIDS and several other sexually transmitted diseases (STDs). As a result of the migration of population from rural to urban and semi-urban areas, the natural resources are getting depleted. The haphazard industrialization in the country also polluted the environment through the discharge of industrial wastes. But the planners and policy makers could not adequately consider the life and illness of the workers and the destruction of natural resources as capital cost, which possibly needs to be added to the cost of production. Haphazard growth of industrial and service sectors compelled many workers to work under hazardous condition, though the exact number of such people and also those who meet accidents and injuries is not known.

4.2.2 Health Status of Workers in Agricultural Sector

As compared to the workers in industrial and service sectors, the number of agricultural workers is exceedingly high. Agricultural workers form 81 per cent of the total labour force of the country (NPC, 1997). With the growing use of fertilizer and pesticides in the agricultural sector, many of the agricultural workers have to work amidst harmful pesticide chemicals. As the farmers in general lack necessary knowledge and skill to use the pesticide chemicals, the health of the workers is affected. Also affected from the harmful pesticides are the ecological and environmental conditions. Information, however, on the disease caused by pesticide is awfully lacking.

4.3 Effects of Pollutants on Health

There has been a significant growth in the diseases caused by environmental pollution. More and more news about the diseases associated with pollution have been published through electronic and print media. People in Kathmandu Valley strongly protested against the emissions of Himal Cement Factory, Chobhar and Godavari Marble Industry, Godabari. In addition, the social workers and villagers protested the dumping of solid wastes in Gokarna filling site and other areas of the Valley. People's wrath against the municipalities has grown for piling wastes on various streets of Kathmandu Valley. The pollution of Bagmati river has been an issue of concern for many of the people. Outside Kathmandu Valley, the level of pollution in Biratnagar, Janakpur, Birgunj, Nepalgunj and other places have equally invited wrath of the people. The level of pollution all along the routes of Mt. Everest and other Mountain Peaks has grown. On account of the growing level of pollution in certain rivers, the fish and aquatic animals have declined.

4.3.1 Motor Vehicle Exhausts and Health

Among the different kinds of pollution, the motor vehicle exhaust is of primary concern. It is mainly due to the excessive number of motor vehicles and the lack of proper mechanism to control them that the atmospheric pollution has been

increasing. Exhausts from the vehicles emit lead, carbon monoxide, sulfur oxides, nitrogen oxide, ozone and photochemical oxidants. Composition of the vehicular exhaust depends on fuel, type and operating condition of the engine. Vehicular exhaust beyond certain levels adversely affects public health, though its effect on different age group of people widely varies. Some of the major effects of vehicular pollutants on the health of the people are:

Lead poisoning

Presence of alkyl lead additives in motor vehicles creates inorganic lead emissions. It enters into the body through the lungs and the gastrointestinal tract. The lead content in blood causes IQ deficiency in children. High exposure of lead might even create gastro-intestinal tract disorder and kidney dysfunction. Other major lead poisoning agents not only create disturbances in BP and nervous systems but they are also responsible for abdominal cramps, headaches, constipation, loss of appetite, fatigue, weakness, lack of muscular coordination, miscarriage, and anemia. The concentration of lead has been reported to be in the range of 0.27 $\mu g/ m^3$ for 24 hours of averaging time and 0.53 $\mu g/ m^3$ for 8 hours of averaging time in Kathmandu Valley (Table 3.8/3.9.)

Carbon Monoxide

Exhausts from the motor vehicles produce carbon monoxide (CO), which is easily absorbed in the lungs. When it assimilates with the blood, it affects hemoglobin and impairs the oxygen carrying capacity of the blood. It affects the normal flow of oxygen to the tissues and the foetal growth in pregnant women. Besides, the functioning of heart and brain is affected. It reduces the productivity of the workers and raises their discomfort. BP and headache are also the outcomes of CO poisoning. The concentration level in Kathmandu Valley is reported for 24 hours of averaging time as 1878 $\mu g/ m^3$ and for spot monitoring for the period of 5 minutes as 8788 $\mu g/ m^3$ (Table 3.7/3.8). WHO Air Quality Guidelines (2000) recommends 100,000 $\mu g/ m^3$ for 15 minutes of averaging time and 10,000$\mu g/ m^3$ for 8 hours of averaging time.

Sulfurdioxide

Though the sulfur dioxide forms only a small portion of vehicular exhausts, it is responsible for chest pain, irritation in respiratory track, bronchitis, burning sensation in nostrils and sore throat. The concentration level of SO_2 as 24 hours of averaging time has been reported to be 26 $\mu g/ m^3$ to 286 $\mu g/ m^3$ for the spot monitoring (Table 3.7/3.8.)

Nitrogen Oxide

The nitrogen oxide (NOx) is irritating and it creates problems when it is absorbed into the mucosa of the respiratory system. As per the standard, the NO_2 should not

exceed 400 $\mu g/m^3$ for an hour and 150 $\mu g/m^3$ for 24 hours. Usually, the NOx has a tendency to damage the lung cells and tissues and aggravate the asthmatic condition. The concentration level of NO_2 as 24 hours of averaging time has been reported to be 27 $\mu g/m^3$ and 195 $\mu g/m^3$ for the spot monitoring (Table 3.8/3.9.)

Hydrocarbons (HCs) and Volatile Organic Carbons (VOCs)

HCs and VOCs are found in vehicle exhausts. They cause irritation in the eyes, apart from creating problems like coughing, sneezing and drowsiness. However, authentic information about HCs and VOCs is not available in context to Nepal.

Ozone

The presence of ozone in vehicle emission irritates mucous membranes of respiratory system and causes such physical problems as coughing, choking, headaches, discomforts, pneumonia, heart disease, asthma, bronchitis and emphysema. There is paucity of information in regard to the impact of ozone on health.

Particulate Matter

It causes irritation in mucous membranes and creates respiratory diseases, which leads to cancer. Experts have found co-relation between suspended particulate and infant mortality in urban areas. This is considerably high in the air of Kathmandu Valley and has been discussed in Chapter 3 in detail.

4.3.2 Arsenic Contamination and Health

Arsenic contamination is gradually being realized as a health problem in Nepal. The draft report on National Arsenic Policy submitted to the MoPPW is yet to be endorsed where the arsenic standard for Nepal is fixed at 0.05 mg/l in par with India and Bangladesh. Understanding the seriousness of the situation, DWSS in cooperation with WHO/Nepal conducted a series of water tests in Jhapa, Morang and Sunsari districts of Nepal in 1999 with a view to formulating the drinking water quality standard. Of the 268 samples taken by DWSS, 91 per cent were found to be within the WHO Guideline value for arsenic in drinking water of 0.01 mg/l. The remaining 8 per cent samples exceeded the standard as it was in the range of 0.01 – 0.05 mg/l and the rest 1 per cent was above 0.05 mg/l. Of the total water samples of 1990 in Nawalparasi, Rautahat and Bardia districts, the Nepal Red Cross Society (NRCS) and Japan Red Cross Society (JRCS) found that the concentration of arsenic in groundwater was well within the WHO standard of 0.01 mg/l in 83 per cent cases but it was between 0.01 to 0.05 mg/l in 15 per cent cases and above 0.05 mg/l in 2 per cent cases (Tandukar, 2000).

Recent statistics show that of the 526 samples collected from Rautahat, 49 per cent had arsenic concentrations over 0.01 mg/l (WHO standard); whereas 17 per

cent had concentrations over 0.05 mg/l (India and Bangladesh standard). Moreover, of the 665 samples collected from Parsa district, 11 per cent crossed the arsenic concentration level of 0.01 mg/l and a little over 1 per cent exceeded the 0.05 mg/l limit (The Kathmandu Post, July 29, 2001). In Lakhanpur VDC of Parsa district, the concentration of Arsenic in water is still higher, which is of about 0.46 mg/l.[3]

Arsenic is accumulated in hair, nail and skin. In its early stage, some of the common arsenic poisoning symptoms, include muscle weakness and aching, skin pigmentation in eye lid, nipples, chest and axilla, skin oedama, garlic odour of breadth and perspiration, excessive salivation and sweating, generalized itching, sore throat, numbness, liver enlargement, and kidney dysfunction (Susheela, 1999). Impact of arsenic on the health, however, depends on the amount of arsenic ingested, the intake of nutritional food and the immunity of an individual.

4.3.3 Noise Pollution and Health

In Nepal, motor vehicles, air transportation, industries and community music are mainly responsible for noise pollution. Noise level recorded 80-100 decibels (dB) in 8 locations of Kathmandu. In 28 industries related to textile, metal, cement and flour in and outside Kathmandu, the noise level exceeded 90 dB as against the recommended tolerable limit of 90 dB (for 8 hours) in the USA and in UK. In certain textile factory in Balaju, the noise level of 120 dB exceeded far more than the recommended standard and affected the health of the workers (NEHI). Community noise by loud music in rural and urban areas, particularly on the religious and social ceremonies, also pollutes the environment. Various tests have confirmed that high concentration of noise impairs the hearing ability of the persons. The magnitude of the problem associated with hearing problem is directly related to the number of years exposed to excessive noise. Besides, it directly affects the physical and mental well being of the people and causes problems related to breathing, dizziness, nausea, BP and vision. However, effective regulations in regard to the control of noise pollution are lacking in Nepal and the reports available are of specific nature which do not indicate much about the magnitude of the problem in noise pollution.

4.4 Psychosocial Problems

Many of the Nepalese suffer from psychological disorders. But there is a paucity of data on the magnitude of psychological disorders and its impact on the health of the people. It is estimated that nearly 10 per cent of the Nepalese suffer from mental diseases (NPC, 1998).

The suicide causes 9.5 per cent deaths among the women of reproductive age group of 15-44 years. Depression is the root cause of suicide among the women. Highest incidence of suicide among the women was recorded in the age group of

[3] Based on information from DWSO, Parsa.

15-24 years with 2-3 children. It is distressing that the women committing suicide ceases interest in breast feeding and maintaining harmonious relations with family members, including their husbands.

Medical treatment for those who suffer from psychological disorders is relatively expensive. So the poor people cannot easily afford to pay for such treatment. Psychotherapy for these patients is still more expensive and such a service is not easily available. There are only a few specialized agencies to provide mental health services to the population. The fact that the psychological problems of the common people have been deteriorating is known from the rising trend in the homicidal and suicidal rates, an increase in alcoholism and the growing sale of tranquilizer, analgesic and peptic ulcer drugs. Normally, the large number of mentally ill population are treated at the general medical outpatient departments of general hospitals. The psychosocial disorders might be attributed to noise and several other environmental pollutants.

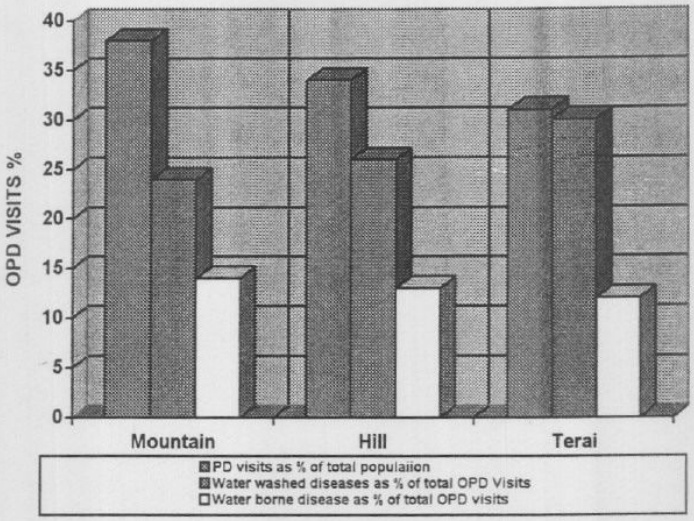
4.5 Infectious Diseases

Apart from the above diseases, some infectious diseases caused by certain environmental pollution related to land and water affect the public health. Some of the major infectious diseases in this category are:

Diarrhoea

In Nepal, diarrhoea is one of the main water borne diseases. The prevalence of water borne and water washed diseases is given in Figure 4.1. Nearly 25 percent of the child deaths are associated with diarrhoea, mainly acute diarrhoea. Acute diarrhoea also adds to morbidity and mortality among the adults. The mortality rate from diarrhoea was 12 per 100,000 population; whereas the morbidity rate was 612 per 100,000 population (Bista, 2001). Normally, the epidemic of acute diarrhoeal diseases starts during the pre-monsoon (April-May) season, peaking up in the month of July-August, and declining with the end of monsoon (September-October). Unsafe and contaminated drinking water; poor sanitation resulting from the lack of hand washing practices mainly after defecation; and consumption of stale, additive and unhygienic food are the main attributes of diarrhoea. About 80 per cent of the people do not have access to latrines and 39 per cent are devoid of water supply facility. However, the magnitude of epidemic caused by cholera has declined. Until a few decades ago, an outbreak of cholera used to kill substantial number of population both in the rural and urban areas. Statistics show that the total diarrhoeal deaths declined from 470 in 1997-98 to 226 in 1999-2000 (Annual Report, 1999/2000), which is partly due to the access of the people to health services and partly due to the awareness for hygiene and sanitation. The poor environmental sanitation in regard to water supply and improper waste management have greatly affected the situation.

Figure 4.1 : Prevalence of Water Borne and Water Washed Disease in Nepal (1998)



Japanese Encephalitis (JE)

It is one of the fatal diseases transmitted to human bodies through the bite of mosquitoes. They ingest the disease causing micro-organisms (Flavivirus) from infected pigs and cattle and inject into the bodies of human beings. The carrier mosquitoes find suitable environment to breed in unsanitary surrounding of dirty and stagnant water. Because of this problem, JE occurs mostly in the Terai and inner Terai region of Nepal almost each year ever since it was discovered in 1978. On an average, 500 to 700 cases of JE occur in the country each year. The incidence rate of JE was lowest in 1981 (0.2/100,000 population) and highest in 1992 (3.8/100,000 population) (Bista, 2001). In the year 2000, over 50 people died and 500 affected through this epidemic. In 2001, the epidemic claimed 19 lives in Banke and Kailali, 17 in Nepalgunj and 2 in Dhangadi (The Kathmandu Post, July 30, 2001). Normally, JE starts in the rainy season (June-July) and reaches its peak in September-October.

Meningitis

Virus, fungus, bacteria, spirochaete, rickettsia, protozoa and helminthes cause meningitis. Statistics available from certain hospitals show that the casualty due to meningitis is around 700 cases each year. But it is widely believed that this figure is under-reported. Actual number of people died or affected by meningitis is higher. The vector of the disease is the mosquito.

Visceral Leishmaniasis (Kala-azar)

Kala-azar or visceral form of leishmaniasis, a major public health problem in Nepal, is a group of protozoal disease caused by parasites of the genus leishmania. It is transmitted to the human body through the bite of infected female phlebotomine sand fly. The annual incidence rate of the disease varied from 1.5 per 100,000 population to almost 21/100,000 population. Between 1980 and 1998, 13,251 cases of Kala-azar were reported of which 320 people died (Bista, 2000). However, the incidence of the disease per 100,000 population declined marginally from 32.7 to 29.67 between 1997-98 and 1999-2000 (DHS, 1999-2000). The disease breaks in the monsoon season affecting people of all age groups, particularly those in the age group of 10 to 20 years. Increased cases of kala-azar are traced in eastern and central Terai region of Nepal mainly among the rural communities associated with poor environmental condition. The cases of Kala-azar is reported from 12 Terai districts where 5.5 million people are at risk of this disease. The prevailing unsanitary situation and poor household management contributes to this disease (see Box 4.1).

Box 4.1

Kala-azar patients continue to swarm Kathmandu hospitals

Five people have been killed and another 174 cases of Kala-azar have been reported in the past three months, which doctors and specialists say is an alarming situation. Everyday, more and more people are coming to the capital for the treatment for this deadly disease. The disease has increased dramatically during the past ten years. There were 147 cases reported in the year 2056 BS with four deaths but the number jumped to 293 cases the next year with 14 deaths. The data, which is from cases recorded in government health centres only, indicates the increasing trend of Kala-azar that should be given serious priority. The actual figure could be much higher from remote areas where there are no health or detection facilities.

The disease is transmitted to humans through the bite of female sand fly, which breeds in organic debris. The fly, which is smaller than a mosquito, hops upto 8 feet instead of flying attacking victims who are either sleeping or lying low. "Kala-azar is a disease primarily found in rural communities and around poor sanitary condition, and is largely called the Poverty Disease," said Dr. Suman Thapa of Sukraraj Tropical and Infectious Disease Hospital (STIDH) in Teku.

During the 1960s and 70s, insecticide spraying played a remarkable role in reducing the prevalence of Kala-azar. But with the withdrawal of insecticide spraying, massive resurgence of Kala-azar reoccurred in Indian State of Bihar in 1977 and at the same time hitting West Bengal and adjoining areas of Nepal. The disease has now spread to Jhapa, Morang, Sunsari, Saptari, Siraha, Dhanusha, Mahottari, Sarlahi, Rautahat, Bara districts and other Terai regions bordering Bihar.

The STIDH provides free treatment to patients effected by tropical diseases. However, with the ever increasing number of Kala-azar patients, "this calls for a need of a co-ordinated approach to attack the vector and raise awareness programmes to detect the disease as soon as possible, " says Dr. Achyut Bhattarai also of STIDH.

Source: The Kathmandu Post July 25, 2001

Viral Hepatitis

Viral hepatitis is one of the serious public health problems mainly in urban areas ever since it was first detected some three decades back in Kathmandu Valley hospitals (Second Long Term Health Plan 1997-2017). Hepatitis virus A is mostly transmitted by faecal-oral contamination of water and food and is, thus, caused by poor hygiene and sanitation status of the people. On the other hand, hepatitis B virus infection not only affects the children but also to the health-care and public safety workers, mentally disabled persons, sexually active homosexual men, illicit injectable drug users, recipients of certain blood products, sexual contacts with HIV carriers, etc. Crude estimate shows that nearly 10-15 per cent deaths among the pregnant women are caused by hepatitis. In the Central Development Region (CDR) alone 926 cases of hepatitis were reported in 1991; of which 10.6 per cent died (Bista, 2001). Over the years, there has been an increasing trend in the hepatitis cases in the country. Statistics show that in Ayurved Hospital alone, the hepatitis patients constituted 12 per cent of the total 46,000 outpatients (new and old). Ayurved Hospital is treated as specialized agency for the treatment of hepatitis (Niraula, 1998).

Malaria

Malaria is one of the old forms of diseases in Nepal. The disease is cured if early diagnosis and prompt treatment is done. An effort was made to control the disease in1954 under the Insect Borne Disease Control Programme supported by USAID. With a view to eradicating malaria from the country, the malaria eradication programme was launched in 1958. Until 1998, different kinds of insecticides like DDT, malathion, primiphosmethyl, bendiocarb, and lamdacyhalothrin have been used for vector control under the Nepal Malaria Control Programme (MCP). Impact of the DDT use on health is given in Box 4.2. Under this programme, indoor residual spraying is conducted depending on the intensity of the problem.

Box 4.2

DDT linked to health problems

Pregnant women exposed to the insecticide DDT are much more likely to give birth prematurely, or to full-term but low birth weight babies, says a US team. Although DDT is now banned in the developed world, it is still widely used elsewhere to combat malaria, particularly in Africa.

"One of the reasons this finding is important is there are not any generally accepted adverse health effects of exposure to DDT or its metabolite, DDE, in humans," says researcher Matthew Longnecker of the US National Institute of Environmental Health Sciences in North Carolina.

Longnecker analyzed data on 2380 babies born in the US in the 1960s, when DDT was till widely used. He also measured the concentration of DDE, a metabolite of DDT, in blood samples taken from the mothers during pregnancy. His team found that the risk of premature birth or low birth weight rose with increasing concentrations of blood DDE. A high blood DDE concentration was more strongly linked to prematurity than maternal smoking.

Premature babies account for a large proportion of infant deaths. If high DDT exposure really does cause prematurity, the insecticide could have accounted for 15 per cent of infant deaths in the USA in the 1960s, Longnecker estimates.

DDT has been proven to have adverse effects on bird reproduction, in particular. Environmental groups have long campaigned for an international ban. But the insecticide is cheap and highly effective against the mosquitoes that spread malaria.

Source: Kathmandu Post, August 1. 2001

The malaria control services have been provided to nearly 15.6 million people in 64 districts. Mention is made about the risk factor related to DDT use in Box 4.3. Those who are affected most from this disease are impoverished and marginalized people of rural areas affected by malnutrition, bacterial and parasitic infections and infestations. Sometimes back, Nepal was declared malaria-free country. But this disease reverted back. Malaria infected cases are still reported and a few deaths from this disease occur each year. Of the 103,298 blood slides examined in 1999-2000, 9 per cent were detected as malaria-positive (DoHS, 1999-2000). But the magnitude of the problem from malaria substantially reduced as compared to the situation in 1950s. The improvement of environmental sanitation could have contributed more towards the control of malaria as the sanitary situation due to poor management of water and wastewater favours the mosquito breeding to a great extent.

Box 4.3

DDT and malaria: whose risk and whose choice?

A treaty of the United Nations Environment Programme signed in May 2001 bans the manufacture and use of DDT for all purposes – but with an exception for public health use because of its advantages in fighting malaria. Yet despite this exception, some donor agencies and governments will not fund its use.

DDT could pose harms to health: it may be a carcinogen, and it could interfere with lactation, though neither of these harms has been conclusively confirmed. But it is up to developing countries to weigh these considerations against the benefits of DDT as often the only affordable, effective tool against a disease that kills more than 1 million people a year, mainly children in poor areas of the tropics. In the absence of better alternative, at least 23 tropical countries use DDT to fight malaria, yet they may be prevented from continuing to do so.

Source: Human Development Report 2001

Parasitic infestation

The soil-transmitted helminthes (STH) is one of the major health problems in Nepal. But there has been very little effort to investigate the nature of soil contamination with STH eggs of both human and animal origin. Intestinal parasites, including hook worm, round worm and whip worm, affect digestion, appetite and absorption capacity particularly among the children. Any delay in curing the disease might even cause morbidity and mortality of the children. The children face acute health problem due to parasitic infection. Of the 145 children of Okharpauwa VDC (Nuwakot district), 63 per cent were found to be positive for helminthes eggs (Rai & et al, 2000, p. 17). In another investigation carried out in Kathmandu Valley and rural areas outside the Valley, 57 per cent cases recorded positive for helminthes eggs (Rai & et al, 2000, p. 390). Common forms of helminthes in the area included *lumbricoides* and *trichiura*. The improvement of the basic environmental and sanitary conditions through community oriented health education and periodic de-worming programmes could contribute towards the control of STH.

4.6 Indoor Pollution and ARI

Industrial and atmospheric pollution mainly in the rural areas is lacking. But the wood and other biomass fuels are burned in unvented fireplaces and stoves, which is the major source of indoor pollution. Women and even children is the main victim of indoor pollution as they have to spend considerable period of time of their day-to-day life close to the fireplaces and stoves. Because most of the dwellings in the rural areas are ill ventilated and without chimneys, the smoke pollution proves highly injurious to health of the people. Other major source of indoor air pollution is the tobacco smoking. The country is known to have highest rates of tobacco smoking population as the prevalence rate of smoking was 78 per

cent in Chandannath (Jumla/mountain); 68 per cent in Sundarijal and Bhadrabas (rural Kathmandu/hills); 37 per cent in urban Kathmandu/hills; and 54 per cent in Parasauni/Terai (Pandey, 1998).

Acharya found that 75 per cent of the male and female population in the age group of 20 to 70 years in Kotyang VDC in Kavrepalanchowk district were addicted to smoking; whereas the figure for Bhadrakali VDC in Kathmandu district was 62 per cent (Acharya, 1993). He also found that 10.07 per cent of the school children in Shivapur School in Kathmandu Valley were regular smokers.[4]

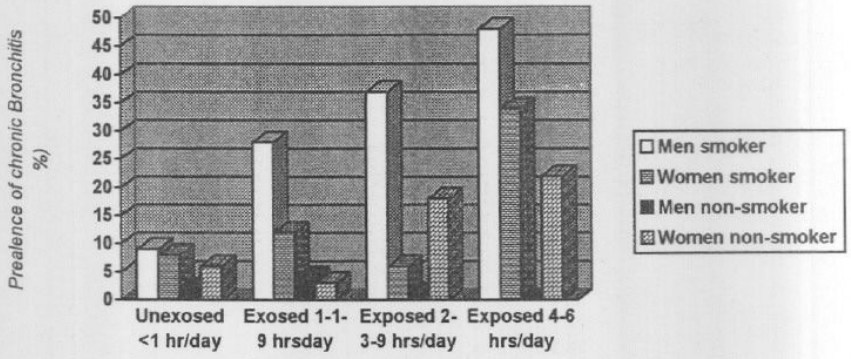
In one study carried out in 1985 in rural area of Nepal, it was found that the lung function in Nepalese rural women declined with an increase in the duration of exposure to smoke. In another study carried out in one urban and three rural areas of Nepal in 1988, a higher incidence of chronic bronchitis and *cor pulmonale* was observed. Survey works confirmed a very high level of chronic bronchitis in urban Kathmandu (11.3 per cent), Parasauni/Terai (13.1 per cent), Sundarijal and Bhadrabas/Hill (18.3 per cent) and Chandannath/Mountain (30.9 per cent). The *cor pulmonale* was less in Parasauni (0.5 per cent) but it was as high as 1.5 per cent in Kathmandu, 1.6 per cent in Sundarijal and Bhadrabas and 5.6 per cent in Chandannath. Thus, a positive co-relation was established between prevalence of chronic bronchitis and exposure to domestic smoke pollution among the smokers and non-smokers. The environmental air pollution – indoor and outdoor – affects the normal functioning of the lung, which ultimately causes disability and the loss of human productivity through shortness of breath. Research work conducted in the high-altitude areas of the country further testifies that the domestic smoke is responsible for the acute respiratory infection (ARI) among the infants (Pandey, 1989).

In two villages, a statistically significant positive correlation was found between prevalence of chronic bronchitis and exposure to domestic smoke pollution in both smokers and non-smokers as shown in the figure (Pandey et. al., 1988).The study also took an account of not only cigarettes, but also *bidi, hukkah,* and *sulpa* as tobacco smoking agents.

The chronic bronchitis increased significantly among men smokers with an increase in hours of exposure to domestic smoke pollution. It also indicates similar pattern among women smokers. Thus, the exposure to both smoke pollution and tobacco smoking have worse effects (figure 4.2).

[4] Interview with Professor G. P. Acharya, Chairman, NHRC

Figure 4.2 Prevalance of Chronic Bronchitis and Level of Exposure to Domestic Smoke Pollution in Two Villages (Sundrijal and Bhadrabas)



Source: Pandey et. al., 1988

4.7 Cardio-Vascular Disease

Medical experts are highly concerned about the threat caused by pollution on heart diseases. However, there has been no adequate study in Nepal about the relationship between the level of air pollution and heart diseases. In the developed countries, several researches have been carried out in this area. Recently, the British Heart Foundation (BHF) provided funds (182,000 ponds) to the University of Birmingham to study if there is any relationship between air pollution and heart attacks. Studies show that the cardiovascular disease is the no. 1 killer in the United States, responsible for about half of the deaths. The tiny pieces of particulate, largely caused by the vehicular emissions, are mostly responsible for the heart trouble. In fact, the size of the particulate matter such as the inorganic ions of nitrate and sulfate and the trace metals are even smaller than 2.5 microns in diameter and so easily breathable. Additionally, the gases like the sulfur dioxide, nitrogen dioxide and ozone are also breathable.

A healthy person more often escapes heart disease even after breathing particulate but somebody with diseased heart like that of a old person is seriously affected. Acharya found that of the total 3424 cases in Tribhuvan University Teaching Hospital (TUTH), 19 per cent had cardiovascular diseases (Acharya, 2000). Tobacco smoking and biomass burning practices could be the major contributing factors for cardiovascular diseases in Nepal. Death rates for the smokers in all age groups are two and three times higher than for non-smokers. In Nepal, there has been an increase in heart diseases, which is known from the analysis of new cases of out-door patients of heart diseases in Bir Hospital. The new cases of heart disease out-door patients almost doubled from 1081 in 1989-90 to 2141 in 1996-

97. Of the total patients of heart diseases, the male female ratio was 52:48 in 1996-97 (Niraula, 1998).

4.8 Conclusion

Pollution affects public health. The higher the level of pollution, the greater is the chance of the outbreak of different kinds of diseases. However, due to the lack of awareness in the society, the workers and employers engaged in various occupations in the industrial, agricultural and other sectors are not adequately concerned about the need of clean environment for public health. Inadequate occupational health guidelines and standards on the one hand and the weakness in their implementation on the other are the major factors responsible for such problem. Hence, the agricultural and industrial workers fall victim to different kinds of diseases.

Motor vehicular emission is one of the major public health problems. Its exhausts in the form of lead, carbon monoxide, sulfur dioxide, nitrogen oxide and particulate matter give rise to different diseases, including cardio vascular diseases, cancer, asthma, disturbances in BP and nervous system, abdominal cramps, headaches, bronchitis, miscarriage and anemia. So far in the Nepalese context TSP is considered as the major parameter of health concern because the other parameters are within the permissible limit of WHO air quality guidelines. But the poor conditions of vehicles plying on the roads and the types of fuel used can worsen the situation at any time due to the lack of Emission Standards enforcement mechanism.

Moreover, indoor air pollution causes ARI mainly among the women and children, which is due to the high rate of biomass burning and tobacco smoking.

Arsenic contamination of ground water is considered to be health problems in certain areas of the Terai and studies have also reported arsenic related diseases in those areas. The noise pollution caused by motor vehicles, air transportation, industries and community music affects hearing ability and breathing. It is also responsible for psychological problems.

Of the infectious diseases, diarrhoea, JE, meningitis, kala-azar, viral hepatitis, malaria and parasitic infestation are the results of poor sanitary situation in the surroundings of the people. Unsanitary living environment especially in the rural areas has contributed more towards the water and vector borne diseases.

Because of the polluting environment related to air, land, water and noise, a number of diseases occur affecting and killing different sections of the society both in the rural and urban areas. However, information in regard to the impact of pollution on health such as cardiovascular disease is utterly lacking.

Chapter Five

NATIONAL INFRASTRUCTURE FOR HEALTH AND ENVIRONMENT

With an increase in the environmental health problem, HMG/N, NGOs, INGOs, donor agencies, local communities and consumers have tried to raise the level of awareness among the common mass of the population about environmental protection. Some of these bodies are specialized in the environmental issues and their participation in land-use, plantation, protection of water resources, improvement of public health, development of small and cottage industries and the protection and promotion of bio-diversity have proved useful (NPC, 1998). Because of some of these developments, certain infrastructure among the governmental, non-governmental, donor and other institutions in environmental health sector has already been built. Besides, they have also developed certain institutional capability to address the problems in environmental sector. In this context, the assistance extended by WHO is commendable. USAID has also been supporting environmental health programme particularly toward the prevention and control of infectious and vector borne diseases through its **Environmental Health Project (EHP)**. This chapter includes an overview of existing environmental health programme, institutional capability and recommendations for the strengthening of environmental health program and institution.

5.1 Emergence of Nepal Environmental Health Initiative (NEHI)

Since the introduction of Nepal Environmental Policy and Action Plan (NEPAP), the government expressed its commitment to incorporate environmental concerns into country's development process. NEPAP formulated strategies in a multi-sectoral framework and gave major thrust on maintaining natural environment, cultural heritage, health and safety of the people. Based on the NEPAP's sectoral environmental strategies, the concept of Nepal Environmental Health Initiative (NEHI) was developed in the draft form. An effort was made in this report to consider the environmental health not in isolation but as a composite factor. Under NEHI, focus was given to such aspects as the environmental health, identification and assessment of environmental health hazards, integration of health and environmental factors, incorporation of environmental concerns in development process, launching of environmental health programme activities and create environmental health awareness. But due to the lack of initiative on the part of the government, it is not known if the draft of NEHI was ever finalized.

Therefore, no major breakthrough was made towards integrating health and environmental issues in the development plans.

5.2 WHO Environmental Health Programme

Since 1970s, WHO has been supporting Health Education in the Department of Health Services (DoHS) under the Health Promotion Programme of HMG/N. It has also been supporting infectious diseases control programme. But it was from January 1998 only that WHO initiated Environmental Health programme under Protection of Human Environment (PHE) (NEP-PHE-001). The duration of PHE is of two years (1998-1999 & 2000-2001) with approximate investment amounting to US $ 400,000. The second phase of PHE for another two years will begin from 2002.

The important components of PHE are:

- Community Water & Sanitation Programme under the Department of Water Supply and Sewerage (DWSS)
- Healthy Cities under the Department of Housing and Urban Development
- Environmental Health Unit under NHRC

Till 1997, WHO worked with DWSS as its focal point in areas not only related to water but also with air quality. So much so that WHO also initiated the idea of healthy cities with DWSS. But considering the fact that DWSS does not have all the expertise related to environmental health, WHO diversified its focal points and tried to work with institutions having specialization in certain areas. Now apart from working with DWSS and MoH, WHO has been working with MoPPW and MoPE. WHO's collaboration with NHRC developed in Research & Development (R&D) sector. In the next phase of the implementation of PHE, WHO will further diversify its focal points for such new areas as Food Safety and Chemical Safety.

Achievements

WHO's contribution in Nepal as in other countries is in the form of technical support given to HMG in the environmental health sector. It is due to WHO's assistance that HMG/N has gained considerably in the sectors like:

- Controlling infectious diseases through the Epidemelogy Directorate of DoHS.
- Human Resource Development under which 80 per cent of the engineers of DWSS received degrees since 1980s and they have also benefited from fellowships and participation in conferences & through exchange visits.
- Institutional Capability Building under which assistance is given in procuring computer and other equipment.
- Water Quality & Surveillance to run pilot projects
- Environmental Health Unit at NHRC to run research activities.

- Hygiene and Sanitation Participatory Programme in four VDCs and 2 semi-urban VDCs

5.3 Institutional Capability

There are many departments, divisions and autonomous organizations under different line ministries, bi-lateral agencies and non governmental organizations, which are involved in activities related to the control of environmental pollution. Majority of these organizations concentrate on the problems of environmental effects rather than going into the depth of health effects. However, it is not known as to what extent they are capable and effective. The institutional capability of the ministries and organizations working in environment and health sectors are:

Governmental Sectors

MoPE and MoH are the main ministries responsible for environment and health issues. The MoPE was established in 1995 to take care of policy aspects of environment. However, the institutional capability of these ministries is not adequately developed due to the lack of required resources and specialized manpower. This is also one of the reasons why the rules, regulations and standards in certain areas are not effectively enforced. In MoPE, for example, the number of officers working in Environmental Division is less than 25. The main units in MoPE are:

- Environmental Policy Unit
- Environmental Standards, Monitoring and Evaluation Unit
- Environmental Impact Assessment Unit
- Land Use Unit
- Pollution Control Unit
- Environmental Conservation Fund Management Unit

Recently, MoPE collaborated with Dannida for Environmental Sector Programme Support, which covers quite a number of potential issues related to environment.

Though the MoH has covered environmental health in its National Health Policy, this aspect has been largely overlooked. However, the MoH/NHRC established Environmental Health Unit in NHRC. The ministries namely MoPPW, MoI, MoF, MoA and MoLD are also involved in activities related to environmental pollution control. MoPPW established Department of Water Supply and Sewerage (DWSS) to take care of national water supply and sanitation issues. But sanitation aspect is not accorded due importance. The Environmental Sanitation Section (ESS) in DWSS performs certain activities in sanitation sector, however, the resource allocated in sanitation related activities are limited. MoLD is taking care of solid waste management aspects of municipalities. But the institutional capability of MoLD is very much ineffective as the Solid Waste Management and Resource Mobilization Centre established earlier has almost phased out. The other

institution named National Council for Solid Waste Management is not institutionalized to carry out the works which it was assigned for in 1996.

MoI is trying to control the environmental pollution produced by various type of industries. For this, it collaborated with ESPS/Dannida and has started with new approach under the component called Cleaner Production. MoFSC is involved in activities related to the management of green environment and bio-diversity through its well established departments like the Department of Forest, Department of Soil Conservation, and Department of Wildlife. MoAC is taking care of pesticide use and its pollution effects through Pesticide Registration Office of Crops Protection Directorate.

Non-Governmental Sectors

Multilateral organizations like the World Bank, UN agencies (UNEP, WHO, UNICEF) and the Asian Development Bank do take care of environmental impacts while carrying development projects. However, UN agencies like WHO is assisting HMG/N through various programmes in environment and health sectors. UNEP is expected to get involved in various environmental issues in near future. These organizations except UNEP were extensively involved in water supply and sanitation sector where they have made remarkable contribution. Bilateral organizations like Dannida, GTZ, JICA and many INGOs have also contributed in Water Supply and Sanitation sectors. However, the contribution of these organizations towards strengthening the national institutional capability is very limited.

Among many NGOs at national level, a few of the NGOs like ENPHO and NEFEZ have contributed well for environment and health sectors with their limited resources. However, institutional capability of most of the NGOs at the national level is weak.

5.4 Environmental Health Institution

The Environmental Health Unit was set up within NHRC in November of 2000 through tripartite effort of NHRC, MoH and WHO country office. The unit is staffed with an environmental engineer. Since this unit is established within the NHRC, it is supposed to limit its activities to research level. Hence, a great need is felt for an institution, which could execute and implement environmental health projects going beyond present framework of the Environmental Health Unit. In such a situation, the works related to environmental health issues are carried out by various organizations giving scope to duplication of activities. In the absence of the national autonomous body, it is difficult to coordinate the policies, programmes and activities of the different organizations having infrastructural facilities, resources and potentiality to contribute significantly in environmental health sector. Perhaps, in the past some efforts were made to fulfill this gap of co-ordination in environmental and also indirectly in environmental health sector by

setting up Environmental Protection Council (EPC). However, this body functioned more or less as advisory committee and could not deliver the envisaged result. The EPC is still in existence but its existence is hardly realized by institutions other than MoPE. Hence, the role of Environmental Health Unit in all such environmental health software sector as conducting researches/operational researches, developing guidelines and standards needs to be expanded and upgraded as environmental health issues are very important for preventive health aspects.

Though the unit is very small as it is staffed with only one officer, it has taken a shape under an autonomous organization and it has all flexibility to use the infrastructures of NHRC. The unit is in computerized working environment and having access to internet facilities. It is also linked with library facilities that NHRC owns and also has an easy access to conference hall. Since the NHRC is the autonomous organization where the decisions comparatively are taken quickly, it does not have to follow complex bureaucratic procedures.

5.5 Strengthening of Environmental Health Programme

It appears from section 5.2 that WHO Environmental Health Programme has been diversified considering the expertise and specialization in different environmental health sectors in different departments or agencies under different ministries. Therefore, under the existing situation, the approach of one window system did not appear to be appropriate.

The MoH could have taken lead in environmental health sector as in Thailand and several other countries by opening one window system in environmental health sectors. But due to the lack of interest and other constraints, it did not look feasible to make MoH focal point in all environmental health related issues. However, an autonomous organization something like Nepal Health Research Council could focus specially on Environmental Health and function effectively through one window system.

Furthermore, the proposed autonomous council to be named like "National Environmental Health Council" could be set up within the umbrella of Ministry of Health with high level representation from MoPE to fill the above gap in environmental health sector. This institution could be governed by representatives from various concerned bodies, staffed with competent manpower specializing in environmental health field and equipped with adequate logistic facilities.

The major thrust of the proposed institution could be:

- To carry out researches and operational researches in the field of environmental health;
- To formulate policies, programmes and develop standards and guidelines in regard to environmental health;

- To execute and implement the projects as per the needs of the country;
- To raise awareness among different stakeholders on environmental health;
- To advise the government on environmental health issues ;
- To propose rules and regulations and enforce them for the betterment of environmental health conditions;
- To assist in developing specialized manpower and generate resources in environmental health sector; and
- To collaborate and cooperate with organizations working in similar areas.

5.6 Conclusion

Certain infrastructural facilities have been developed in environment and health sectors to address the problems related to environmental health. But there is a lack of coordinating mechanism. Until the proposed National Environmental Health Council is constituted, the Environmental Health Unit in NHRC should be made to expand gradually for carrying out the above jobs. In this respect, focus should be given towards the development of skilled manpower, laboratory and equipment, information and database management, and researches in order to improve the institutional capability of the environmental health institutions in Nepal.

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Annex 1

List of Resource Persons

1.0 Professor Gopal Prasad Acharya, Chairman, NHRC
2.0 Dr. Kamal Gywali, Member Secretary, NHRC
3.0 Mr. Chandra Shekhar Yadav, Environmental Engineer
4.0 Mr. Jan A. Speets, WHO Advisor, Environmental Health
5.0 Mr. Sharad Adhikari, National Operation Officer, WHO
6.0 Mr. Bhakta Raj Palikhe, Registrar, Pesticides
7.0 Dr. B. D. Chataut, Director General, Department of Health Services
8.0 Dr. Mahendra Bahadur Bist, Epidemology Division
9.0 Dr. Tika Karki, Director General, Department of Food Technology and Quality Control
10.0 Mr. N.K. Mishra, Chief, ESS/DWSS
11.0 Mr. Joseph L. Thaller, Project Collaborator, NHRC
12.0 Dr. Nirmal Pandey, Member, NPC
13.0 Dr. Ram Prakash Yadav, former Member of NPC
14.0 Mr. Jan Holmegaard Hansen, Chief Technical Adviser, ESPS
15.0 Mr. Kumar Rajendra Jha, CP/ OHS Adviser, ESPS
16.0 Dr. Lakshmi Narayan Thankur, Senior Program Officer, John Hopkins University
17.0 Dr. Chandra P. Gurung, Country Representative, WWF
18.0 Dr. P.K. Jha, Tribhuvan University

Annex 2

Expired Pesticide stock at AIC Store Amlekhgunj

	Pesticides	No. of Drums	Code
1.	**Endrin Liquid**	**19**	**E**
2.	**Organo Mercury Comp.**	**47**	**HG, HG -1**
3.	**D.D.T Dust**	**16**	**DDT/DDT-1**
4.	**Liudrone Gronuals**	**3**	**Lin**
5.	**Agrymycin**	**3**	**F**
6.	**B.H.C. Dust**	**25**	**BHC - BHCl**
7.	**Organomycin M.K. Liquid**	**23**	**O/I O/A-1**
8.	**Atrazine**	**5**	**At**
9.	**Chloride Dust**	**5**	**Ch/ -1**
10.	**Unidentified Dust**	**105**	**U6 -1**
11.	**Dithones Z 78 M.F.S.**	**25**	**Dil**
12.	**2. A.D.**	**4**	**2-4-D-1**
13.	**Socks Clothes etc.**	**2**	**Sacks**
14.	**Mercury Steel Drums**	**10**	**1/ q-1**
15.	**Empty Drums**	**31 nos.**	**M+(2only.)**

Environmental law in Nepal

By Gyanu Mainali

Present-world is suffering from different kinds of environmental problems. Basically, climate change, global warming, green house effect, destruction of biodiversity, ozone layer depletion, acid rain and pollution are some of the major environmental problems.

Nepal is one of the few countries in the world, which is rich in natural resources, like water, forest and cultural heritage. Its beauty and richness is adversely affected due to environmental problems. Nepal too suffers from different kinds of environmental problems. On the one hand, Nepal is suffering from global environmental problems, and on the other hand, it is facing different kinds of national environmental problems. Nepal has its obligations to implement the international Environmental Laws. It also has to solve the national environmental problems, the main obstacles in this endeavour is the lack of skilled and motivated manpower, lack of public awareness and proper institutions to deal with environment problems.

In Nepal, generally, environmental problems have increased due to inadequate and inefficient environmental planning and lack of proper implementation. Major environmental problems have emerged from land degradation, depletion of forest resources, unplanned urban development, mismanagement of industrial waste and domestic water.

Efforts have been made at the international as well as at the national level to solve the environmental problems. At the international level efforts have been made by the United Nations Conference. International community has developed many legally binding and non-legally binding convention and principles. In this context, the United Nations Conference on Environment and Development - 1992 is a significant one. Nepal, being a responsible member of the United Nations has also played an important role in the development of International Environment Law and its implementation in Nepal. Nepal is a signatory to at least 10 international conventions relating to environment.

Nepal has also formulated the National Environment Policy and passed environment legislation. Ninth Convention Strategy, 1998; National Environmental Policy and Action Plan, 1993, are some of the steps towards environment protection.

The Constitution of the Kingdom of Nepal 1990 is the first constitution incorporating the provision on environmental protection and improvement. Likewise, the Muluki Ain contains provision of animal in chapter 6, land in chapter 8, 9 and 10, some of the provision such as utilization of "Kulo Pani" and protection of recreation places have been made in chapter 8, namely "Jagga Abad Garneko." Besides, provision for protecting public land, trust (Guthi) etc have also been covered in the Act.

In order to give life to constitutional mandates, Nepal has enacted the Environment Protection Act 1997 which came into force on June 24, 1997. Under this Act, the Environment Protection Rules 1997 have been formulated and came into force on June 26, 1997. The same Rules have been amended in 1998, which have also come into force from the date of amendment.

Other important provisions have been embodied in Article 26 (4), which is as follows: "The state shall give priority to the protection of the environment and also to the prevention of its further damage due to physical development activities by increasing the awareness of the general public about environmental cleanliness and the State shall also make arrangement for the special protection of the rare wildlife, the forests and the vegetation."

Nepal has also formulated national Environment Policy aiming to have positive results for a better environment.

In ancient period, environment was socially, culturally and religiously protected. The tradition and practices as well as their values and beliefs paid a great deal of attention to environment. Further, the ethical or moral values were deeply rooted in human practices, which guided them to keep the environment clean. At that time, human attitude towards nature was positive and the religions were playing vital role in influencing human attitude towards protecting environment. It was the duty of each individual to protect the environment and live in harmony with the Nature.

In medieval period of Nepal, environmental laws were not given much attention as compared to that of the ancient period.

Coming to the present context, Nepal is among the few countries now to have a specific provision for environmental protection in the Constitution itself. Recently, Environmental Protection Act 1996 and EP Rules 1997 have been brought into existence and along with this Act and Rules, different policies, guidelines and sectoral Acts are also being introduced and implemented in tune with international commitment and national needs. The process of reform and effective importance of protection and improvement of environment. Much has to be done if we really and effectively want to improve and protect the environment. As regards to Nepalese policies, the existing strategy, various guidelines and policies should be reviewed and reformulated in conformity with the constitutional mandate and the Environmental protection Act 1996 in order to bind them legally.

At the same time, the Environmental Protection Act should also be amended to include new provisions if we are not going to have other specific Act in this regard and to amend the existing provisions in order to introduce competent and independent authority. As far as sectoral Acts are concerned, the existing overlappings and contradictions should also be removed particularly when it comes to authority and punishment. The most important need is to implement the existing laws properly.

Food labelling system

The Kathmandu Post July 20, 2001

By Dr Tika Karki

Countries have enacted respective food laws and regulations for consumer protection taking into account the local realities. The essential characteristic of food is that it should be wholesome, safe and cause no deleterious effect on human health. Food regulations embody protective measures and provisions such as definition of food, adulterated, poisonous foods, subsistence foods or substandard foods, permissible limits to additives like colours, preservatives, and flavouring agents, etc. Establishing the acceptable daily intake of food contaminants such as pesticide residues, mycotoxins, heavy metals, veterinary drug residues etc in foods requires assessment and science-based decisions for ensuring safety to the public as provisioned by WTO.

Food standards are developed keeping in view the sophistication of processing industries, available agricultural technology and practices, and the available infrastructure linking production with marketing. Besides such basic information, other pertinent points are also absolutely necessary for assessing permissible level or acceptable limits based on feeding trials under toxicological evaluations conducted in reputed laboratories recognised by the FAO/WHO Codex system. All this data is gathered and the critical dose or limit for human exposure assessed keeping in view technological and socio-economical applicability. These are the modus operandi of food standard development.

How can consumers buy a product which is presumably safe and within the prescribed and approved limits? What are the criteria or essential components that consumers should give due consideration to? Food laws have established mandatory criteria for assuring the soundness of packaged products and all manufacturers should comply with such requirements.

In Nepal, food laws have made mandatory requirements for labelling such as description of the product, name and address of manufactures, ingredients, net contents and weights, approved additives, batch number and manufacturing date, in Nepali or English. However, these requirements need updating and harmonising with other essentials like good manufacturing practices (GMP), and the code of hygiene practices etc to ensure the safety of food supplies.

The essential criteria for food labelling should be laid down in such a way that consumers can get adequate information about the food. Such information comprises the name of the product which should be clear and specific and not generic. Labels should contain the following information:

1. List of the ingredients - All ingredients of the food should be specified in the descending order of weight. Added water should be declared in the list of ingredients unless forms part of a soup or broth or brine.

2. Net contents and weights - The net contents should be mentioned in the metric system such as for liquid foods by volume, for solid food by weight, for semi-solid food or viscous food either by weight or volume. The drained weight should be declared for food packaged with a liquid medium. The term liquid medium may refer to water, aqueous solutions of sugar and salt, fruit and vegetable juices in canned products etc.

3. Name and address - The name and address of manufactures, packers, distributors, importers, exporters and venders etc should be specified.

4. Country of origin - The country of origin should be declared in the label to avoid unnecessary confusion, or misleading of the consumer. When the food undergoes further processing in a second country with changes in the nature of the product other than originally produced, that second country would be considered the country of origin for labelling purpose.

5. Lot identification - Each container should be marked in code or in clear to denote the identity of the manufacturing industry and the lot.

6. Date marking and storage instruction should be specified.

7. Date of minimum durability - The date should be written in words such as 'best before' wherever the date is indicated. Excluded are the following products:

- fresh fruits and vegetables including potatoes which are not peeled, cut or treated likewise.
- Wines, liquors wines, sparkling wines, aromatised wines, fruit wines and sparkling fruit wines.
- beverages containing 10 % or more of alcohol by volume.
- bakers or pastry products which are normally consumed within 24 hrs of manufacturing.
- vinegar, food grade salt,
- solid sugar, confectionary products consisting of flavoured and/or coloured sugars, chewing gums.
- date of minimum durability should be adhered to with instructions on appropriate storage conditions.

Distorted and misleading food advertisements often make tall claims regardless of wholesomeness safety, and nutritional quality of food. In many cases, such malafide advertisements neither substantiate their claims in terms of composition of foods nor with guarantee of proclaimed quality factors. The food control administration should monitor false statements and advertisements through social marketing. Consumers should be alerted and empowered for not being mislead by irresponsible and untrue information.

The health or nutrition claims for any kinds of food, unless provisioned in food regulations should be prohibited. Unsubstantiated claims should be deliberately avoided. Claims to cure or treat disease should be prohibited unless they are specified as foods for special dietary uses, under the food regulations.

Misleading claims such as 'wholesome' 'healthful' and 'sound' should be avoided. Terms for different foods, such as 'natural', 'pure', 'fresh', 'home-made', 'organically grown', and 'biologically grown', should be practiced as per the national practice in the country along with the code of good agricultural practices and good manufacturing practices.

Nutrition labelling -. This is very important because foods are often claimed as nutritious and healthful. It is true that all foods contain nutrients varying in concentrations depending upon the kind of food. Formulated foods are vulnerable from the point of exaggerated claims of supplying all nutrients which a human body needs. Normally, children, lactating mothers pregnant women and aged citizen, or convalescent people should consume nutritious foods. This group of people is vulnerable. Nutrition labelling denotes the nutritional properties of foods. It comprises two components- a) nutrition declaration and b) supplementary nutrition information. Nutrition declaration lists the nutrient content of foods. Nutrient means any substance normally consumed as a constituent of food and which provides energy or which is needed for growth, development, and maintenance of food or a deficit of which may cause relative biochemical or physiological changes. Supplementary nutrition information is generally targeted at illiterate populations. Such informations should be pictorial or in colour in addition to the nutrition declarations in the label.

Non-compliance of food labelling is still predominant in world food trade no matter whether the product originates in Europe, America, Asia, and Africa. Adherence to food labelling criterion should be taken as the starting point to assure safe food supplies to consumers.

2007 - July - 25

Kala-azar patients continue to swarm Kathmandu hospitals

■ By Tashi Dolma Thinley

KATHMANDU, July 24 -

Five people have been killed and another 174 cases of Kala-azar have been reported in the past three months, which doctors and specialists say is an alarming situation.

Everyday, more and more people are coming to the Capital for the treatment for this deadly disease.

The disease has increased dramatically during the past ten years. There were 147 cases reported in the year 2056 BS with four deaths and but the number jumped to 293 cases the next year with 14 deaths.

The data, which is from cases recorded in government health centres only, indicates the increasing trend of Kala-azar that should be given serious priority, say doctors. The actual figure could be much higher from remote areas where there are no health or detection facilities.

The disease is transmitted to humans through the bite of female sand fly, which breeds in organic debris. The fly, which is smaller than a mosquito, hops upto 8 feet instead of flying attacking victims who are either sleeping or lying low.

"Kala-azar is a disease primarily found in rural communities and around poor sanitary condition, and is largely called the Poverty Disease," said Dr. Suman Thapa of Sukraraj Tropical and Infectious Disease Hospital (STIDH) in Teku.

During the 1960s and 70s, insecticide spraying played a remarkable role in reducing the prevalence of Kala-azar. But with the withdrawal of insecticide spraying, massive resurgence of Kala-azar reoccurred in Indian State of Bihar in 1977 and at the same time hitting West Bengal and adjoining areas of Nepal.

The disease has now spread to Jhapa, Morang, Sunsari, Saptari, Siraha, Dhanusha, Mahottari, Sarlahi, Rautahat, Bara districts and other Teral regions bordering Bihar.

The STIDH provides free treatment to patients effected by tropical diseases. However, with the ever increasing number of Kala-azar patients, "this calls for a need of a co-ordinated approach to attack the vector and raise awareness programmes to detect the disease as soon as possible," says Dr Achyut Bhattarai also of STIDH.

The disease being asymptomatic, can be easily detected in people suffering from malnutrition. Otherwise, the diagnosis is a long and difficult process of "bone marrow aspiration" and "Splenic aspiration". The same diagnosis can be easily done with a help of a medical kit called the K39, which detects the disease with just a simple blood test.

The doctors stressing the need of the K39 kit , said that it could be of a great help to diagnose the disease promptly and effectively.

"Kala-azar is a fatal disease if untreated, with chances of 90 percent succumbing to the disease. But if treated early, then there is actually 90 per cent chances of survival," said Dr Bhattarai.

The Kathmandu Post

Kantipur Publications

Nepal's Largest Selling English Daily

Vol. IX No. 206 Kathmandu, Tuesday, September 11, 2001 (Bhadra 26, 2058)

Hotline service to check adulteration in food items

Post Report

KATHMANDU, Sept 10 - With an aim to address the growing complaints of the consumer regarding adulteration in the food items, the Department of Food Technology and Quality Control has started a hotline service.

In its latest attempt to provide relief to the consumers after it received hundreds of inquiry about the quality of the food items available in the market, the department was coerced to initiate the hotline telephone service.

The complaints of the consumers increased rapidly after the department released its annual report of the last fiscal year, in which majority of the food-item ranging from the cooking oil to bottled mineral water were found contaminated posing a serious threat on public health.

The consumers can now call on 262741 and can register their complaint with the name of the item and its producer, if they suspects the particular goods bought from the market is of low standard. The department has also assured the consumers that the name of complainer would be kept top secret.

Dr Tika Bahadur Karki, Director General of the department hopes that the initiation of such service for the first time in Nepal, can be a milestone in protecting consumer right. "The newly introduced service can be helpful in controlling adulteration to some extent but the effectiveness of the service depends on the responses of the consumers," he told The Kathmandu Post.

He also assured that the department would immediately initiate necessary investigation after it receives complaints from the consumer and would take appropriate steps for the legal action against the producers if found acting against the existing Food Act.

However, consumers will have to pay investigation charge if they come to the department to register the complaint along with the samples of the food-items. Dr Karki suggests that the financial burden of the charge can be minimized by sharing it among the members of community or group. If the consumers repose well, then it would be helpful to activate the role of the department in controlling adulteration of the food-items.

Kantipur Publications

The Kathmandu Post

Nepal's Largest Selling English Daily

Vol. IX No. 217 Kathmandu, Saturday, September 22, 2001 (Ashwin 6, 2058)

Health report proposes reforms

Post Report

KATHMANDU, Sept 21 - The Annual Report, of the year 2056\57, prepared by Ministry of Health, Department of Health Services, focuses on improving the effective health care system that provides affordable and accessible essential health services.

"22 percent of the problems are related to human resources, so the sanctioned posts need to be filled with trained health workers", says the report.

The Infant Mortality Rate(IMR), Child Mortality Rate(CMR), Maternal Mortality Rate(MMR) per 1,000 in the fiscal year 2053\54 is 74.7, 118 whereas the target for the next 20 year is 34.4 and 62.5, 25.0.

The National Health policy, adopted in 1991 with the main objective to extend the primary health care system to the rural areas, curative health services, promotive health services participation, blood transfusion etc.

The second long term health plan, 1997-2017, targets to reduce the infant mortality rate to 34.4 per thousand live births, to reduce the under-five mortality rate to 62.5 percent, to reduce the total fertility rate, to 3.05 percent, increase life expectancy to 68.7 percent.

HIV/AIDs interaction programme held

KALAIYA, Sept 21(RSS)- An interaction programme on HIV/AIDS and venereal diseases was organised here jointly by the AIDS Co-ordination Committee of the district public health office and general welfare foundation with the objective generating people's awareness to check the spread of such diseases.

At the interaction programme chaired by chairman of the AIDS Co-ordination committee and chairman of the district development committee Chhat Prasad Yadav, Dilip Uprety of the general welfare foundation, Surendra Kayastha of the district public health office, Prakash Poudel of children welfare society and women integrated development centre members shed light on the activities being carried out by their respective institutions to generate awareness among the people and check the spread of HIV/AIDS in the country.

The interaction programme was participated in by chief district officer Janardan Sharma Adhikari, DDC vice-chairman Balbir Chaudhary, local development officer Komal Kafle, superintendent of police Hemraj Bahadur Malla, journalists and representatives of other social institutions.

A seven-member committee has been constituted under the convenorship of the district public health office to organise a district level symposium on HIV/AIDS and venereal diseases.

THE KATHMANDU POST, WEDNESDAY, NOVEMBER 7, 2001

Concerns raised over use of pesticides

Post Report

KATHMANDU, Nov 6 - The government has taken several legal measures to control the harmful effect of chemical pesticides under the Pesticide Act and Rules in Nepal, a high level government official said Tuesday.

"The government is committed on the management and control of chemical pesticides for the safety of human and environment for which the government has taken several legal measures," said Acting Secretary at Ministry of Agriculture and Cooperatives Dr Surendra Kumar Shrestha speaking at a programme on environmental risks of pesticides.

Secretary Shrestha also said that the government's ninth plan and the Agricultural Perspective Plan both emphasizes controlled use of pesticides to achieve crop productivity. "Many pesticides that have been banned or severely restricted in developed countries now are still marketed and used in developing countries," said Shrestha.

Minister of State for Science and Technology Bhakta Bahadur Balayar said, "The nexus between environmental pollution, particularly water resources, and increased use of pesticides is yet to be corroborated in Nepal, as extensive research through laboratory and field experiments has not been undertaken".

"With low level of awareness among the people the risk is always there regarding the application and disposal of pesticides," the Minister added.

Speaking on the occasion Prof Dr A Herrmann said, "The environment here doesn't seem much influenced through the use of pesticides". "This is what my three years of research here in Nepal shows".

Prof Hermann pointed out that the reason for such indifference could be accounted for the climatic change which caused the decomposition of pesticides. "Pollution of the environment is not so dangerous as we earlier expected," said Hermann.

The Program Director at the Plant Protection Directorate under the Department of Agriculture, Krishna K Shrestha said that there has never been any comprehensive study regarding the use of pesticides and its effect.

Adarsha Pokhrel, Director General of Department of Hydrology and Meteorology said that the research has adopted a multi disciplinary approach in order to address the complex environmental, agricultural and socio-economic problems associated with pesticide use. "Developing Countries should also focus on the legislative and regulatory issues on the supply, storage, handling, application and safe disposal of unused or date expired pesticides," he said.

THE KATHMANDU POST, FRIDAY, NOVEMBER 9, 2001

Special baskets for domestic waste management

Post Report

KATHMANDU, Nov 8 - Kathmandu Metropolitan City ward No 5 Office and Kathmandu Valley Mapping Programme (KVMP) are distributing special baskets to the housewives of the locality so that they could manage domestic waste at homes, an officer said.

Public Liaison Officer of KVMP Soni Shrestha said the ward office started distributing the baskets in the area for composting waste matters after the Dashain festival.

"We want to see people's participation in this campaign. Consequently, we provide the baskets on the condition that the housewives pay 50 percent of the cost of the basket," she said.

According to her, the price of the basket is Rs 500 and each of the users need to pay Rs 250 to get the basket.

The basket is designed in such a way that one can pour kitchen waste and other bio-degradable garbage from the top and the manure comes out from the bottom after a few days.

Meanwhile, school children are learning the skills to reuse the recycled solid waste in ward No 5. Kathmandu Metropolitan City trainers today trained over 50 members of the Nature Clubs of Tangal Secondary School.

Hari Bahadur Shrestha, Environment Science teacher, said the club members learned about solid waste management, leadership and planning skills in the training.

"It is quite helpful for the students," he said. KMC has formed 17 Nature Clubs in various schools with the participation of students of 7 and 8 standards.

Kathmandu, Saturday, October 6, 2001 (Ashwin 20, 2058)

Unenviable distinction

The health sector has always been a matter of serious concern. But successive governments have failed to come up with a radical approach, which would have brought health for all closer to reality. The neonatal mortality rate has increased to fifty out of every thousand. Maternal mortality in this country is the highest in the South Asia subcontinent. Every summer preventable diseases claim thousands of lives, crippling daily economic activity. And every year a total of over fifty thousand people develop tuberculosis in this country. The reasons for this sorry state are poor sanitation, poor medical facilities and illiteracy, besides debilitating poverty in rural Nepal. This raises a host of questions. What have successive governments done to improve the quality of life of the poor? Is access to health not a fundamental right of all? Doesn't the poor health policy of the government undermine other rights as well? The political parties, particularly the NC, the RPP and UML, have failed to recognize this as a major problem.

A study on the 'State of the world's new borns', conducted by Save the Children US, underlines that the mortality rate of newborn babies has placed this country on the top in the subcontinent and fourth place in the world. This is an unenviable distinction. The survey has highlighted just how effectively the government has implemented health policies and programmes. It also projects negligence and a lack of seriousness on the government's part towards improving public health. Had there been some measures taken that aimed at reducing the infant mortality rate in this country, the overall picture would have been much better than what it is today. Low birth weight, infection, birth asphyxia and congenital anomalies are other factors that have led to a high neonatal mortality rate in this country. This apart, ninety percent of child births take place in the home with the help of family or neighbours, instead of at hospitals.

The annual budget allocated for the health sector does not reach rural Nepal. Part of the budget is misdirected by parliamentarians for their personal benefit, and part of it by bureaucrats, including medical personnel manning the primary health centres or district hospitals. The medicines allocated for health centres and hospitals end up in private clinics, pharmacies and nursing homes. This is the main reason why district hospitals or primary health centres remain without medicines and medical personnel throughout the year. Besides, the doctors working at state-run hospitals and health centres prefer to work in Kathmandu rather than in rural Nepal. The government must recognize that health is as important as education for the public weal. It cannot ignore this by citing poverty and illiteracy. It must educate the poor, improve their quality of living and reduce neonatal mortality.

THE KATHMANDU POST, MONDAY, OCTOBER 8, 2001

Interaction against pollution held

KATHMANDU (PR) - A large number of mechanics and automobile workshop owners met at an interaction programme organised by the Centre for Pollution Studies and Nepal Oil Limited here today, according to a press release from the Institute of Engineering (IOE), Tribhuvan University. The interaction was in relation to vehicular pollution. Dean Prof. Jiba Raj Pokharel and Rabindra N. Bhattarai, director, Centre for Pollution Studies, IOE stated that this awareness is one of the very positive developments happening in the country.

General Secretary of Automobile Professionals Association, Dipak Khadka, Dr.Bhakta Bahadur Ale, Mr. Jib Lal Pokharel and Mr. Khem N. Poudel also participated in the programme. They said that such interactions would provide an opportunity to seek informations regarding various issues involved with auto pollution and so should be held on a regular basis.

Kathmandu, Monday, October 8, 2001 (Ashwin 22, 2058)

Discourage discrimination

The caste system in our society has never been an obstacle to development. Not that this age-old system was not unabolished and lower caste people legally prevented from entering Hindu temples and other religious premises. But the upper caste Hindus always prevented Dalits from attending social gatherings and visiting religious centres and even prohibited them from meeting Hindus from the upper caste. As a result of such discrimination, the lower caste Hindus have remained ignorant, isolated and largely illiterate in our society. Theoretically, the introduction of the new Civil Code banned the practice of untouchability over four decades ago. Unfortunately, the ban was not put into practice as a result of the strong faith in the caste system among the upper caste Hindus. Had successive governments implemented the law, the Dalits, who have been discriminated against on the basis of caste, would have no longer remained a distinct underclass in our society. Mention should also be made here of the need for more affirmative action, including reservations if need be. Reservations should however not be allowed to get out of hand as has happened in neighbouring India. We should learn from the experience of our southern neighbour.

The cast system was a practice introduced only to govern society but it gradually turned into an ugly tradition which should not be allowed any longer. Manu's objective in dividing society into castes was not only to ensure the division of labour but also to govern the social and religious activities of every individual. It had to do more with the specialisation of human skill than discrimination on any basis. However, over the centuries, the caste structures gradually rigidified to restrict certain section of people from attending or mingling at social or religious gatherings. The practice became uglier still when it turned into untouchability. Orthodox Brahmins even ignored the rights to equality and liberty guaranteed in our constitution. Although there are laws against untouchability, the government has hardly taken any action against those who have practised untouchability. This apart, the penalty against violation of this law does not exceed more than 250 rupees. How can the Dalits expect fair and impartial treatment when the Civil Code does not permit a fine of more than 250 rupees, a paltry sum today?

The entry of over 200 lower caste people at Pashupati and Guheshori temples the other day should be taken as a breakthrough towards integrating the Dalits into the mainstream of our society. The government must now stop any caste based social and religious discrimination. Dalits, who are considered untouchable by a section of our society, must be given opportunities to share religious and social platforms. They have been deprived of their rights to equality and freedom due to mere ignorance and crude faith. Orthodox priests, who have upheld faith in untouchability for generations, must not be allowed to practise what is legally prohibited in our society. Above all, more widespread education should be promoted among all classes including the Dalits themselves to foster social awareness that can be a potent weapon in the struggle against social evil.

THE KATHMANDU POST, WEDNESDAY, OCTOBER 10, 2001

Water and food-borne diseases on the rise

Post Report

KATHMANDU, Oct 9 – A majority of population in Nepal are suffering from various water and food-borne diseases largely due to the drinking of contaminated water, consumption of stale and rotten foodstuff, eating of unhygienic meat and living in poor environmental conditions.

Medical experts speaking at a two-day "Multi-sectoral Workshop to Co-ordinate Activities in Response to Water & Food Borne Diseases" stressed the need to adopt preventive safety measures to avoid water and food-borne diseases that are growing in recent days due to uncontrolled population growth and lack of sanitation.

Speaking on the occasion Dr. M.B. Bista, Director, Epidemiology and Disease Control Department (EDCD), emphasised on the need to establish the Epidemic Committee to combat the problem which in the recent years has been growing in the rural and urban areas of Nepal.

Epidemic disease cholera, which is most common, has also been discovered in tourists visiting Nepal. "It's a pity that 55 per cent of the cholera cases are reported from the Kathmandu Valley alone which happens to be the major tourist hub and embassies in the Valley are inquisitive about the scenario.", said Dr. Bista.

Similarly, other medical experts highlighted about the meat-borne and milk-borne diseases.

Kantipur Publications

The Kathmandu Post

Nepal's Largest Selling English Daily

Vol. IX No. 241 Kathmandu, Tuesday, October 16, 2001 (Ashwin 30, 2058)

Experts warn of major environmental disaster at Gokarna dumping site

By Birodh Pandey

MULPANI, Kathmandu, Oct 15- A year ago it was a battleground between the locals, the government and the municipality over the infamous dumping site. But now it is a deserted ground as the government abandoned this place a year ago.

No longer the municipalities truck queue up to dump the hazardous waste into the ground which was categorized as the most sensitive area of Kathmandu valley from every ecological aspects. Sitting next to Rajnikunja Gokarna, the area lies in the catchment area of the Bagmati river, and is less than five kilometers away from Tribhuvan International Airport (TIA), the only international airport infamous for its autumn time bird hazards.

The dumping of waste has stopped in Mulpani or Gokarna after much controversy, but without assessing the post-dumping environmental hazards in the area. Which is way, environmental experts argue, a major environmental disaster is likely to hit the area in near future. They go on to assert that the former Kathmandu dumping ground is developing into a "potential time bomb" ready to explode anytime as the underlying methane gas continues to decompose a faster rate.

"Even if that does not happen such a disaster could be a repeat of the infamous Love Channel tragedy that occurred in New York state, in the United States in 1977," says Bed Mani Dahal, a Waste Management Expert at Kathmandu University. The event saw hundreds of people falling chronically ill due to the dumping of toxic chemicals and garbage, according to him.

ENVIRONMENT WATCH

Environmentalist, geologist and engineers argue that the Mulpani dumping site has been abruptly abandoned by the government after heaping up the capital's garbage for nearly two decades, and with out carrying out environmental auditing - a tool necessary to study the risk factors involved in mitigating the likely environmental consequences in future.

Even the Environmental Protection Regulation 1997 under the article 24 states clearly to carry out environmental auditing specifying the steps to minimize remaining impacts from implementation of the project site that require Environmental Impact Assessment (EIA), but all in vain.

Whilst the government and the municipality continue to shoulder off their responsibilities to each other and narrate stories of plans and masterplans to safely restore the former dumping site, chances of actual implementation of such plans appear slim due to "financial constraints".

"The ministry is seriously concerned about the likelyhood environmental disasters but we have not yet been able to study in details about the possibilities of safe restoration of site due to financial constraints. However we are pursing the donor agencies to help," says Ashok Shahi, Engineer at Ministry of Local Development.

Kiran Ulak, Sanitary Engineer at the Kathmandu Metropolitan City (KMC) and former site in charge of the Mulpani dumping site says the municipality had dug bottom drainage to stop the leachate flow into the ground water table and erected gas extraction pipes to release the underground gas formed by the decomposition of waste.

(See Expert page 8)

Kantipur Publications

The Kathmandu Post

Nepal's Largest Selling English Daily

Vol. IX No. 242 Kathmandu, Wednesday, October 17, 2001 (Kartik 1, 2058)

Greenpeace launches campaign against toxins in Nepal

By Subas Risal

LALITPUR, Oct 16 - Ominous though it may sound, but a staggering 74 tonnes of expired and unwanted pesticides banned world-wide are badly stored in at least three warehouses across the country - Nepalgunj, Amlekhgunj and Khumaltar. The hazardous toxins were lying there for years in leaking containers and torn packages, posing a serious threat to the health of human, animals and the surrounding environment.

Better late than never. Now with Greenpeace, the world environmental organization, finally stepping into the scene, things have started to look up. A campaign to repackage the rusty and leaking canisters is underway. A dozen Greenpeace activists from India, Germany, the UK and Nepal have launched a campaign to clean up six tonnes of obsolete and unwanted pesticides lying in Khumaltar in the first phase of their campaign.

Greenpeace demands manufacturers to take technical and financial responsibility for their waste. "We urge all the multinationals for the immediate retrieval of these toxic wastes from Nepal.

Greenpeace is repackaging the obsolete Greenpeace pesticides to make them ready for sea transport," said Andreas Bernstorff from Germany, a toxic waste expert.

Bernstorff also said that though these toxins are banned world-wide, they are still smuggled and marketed in third world countries. "These hazardous substances banned world-wide are being smuggled to countries like Nepal," he added.

Greenpeace activists containing obsolete pesticide at Nepal Agriculture Research Council (NARC), Khumaltar on Monday. *Photo Courtesy/Greenpeace*

It has been almost 25 years since Nepal received those toxins in form of aid and charity and partly bought by the government. But in Nepal, the problem was not recognised until 1990. The expired and obsolete pesticides were stored in a couple of warehouses by the government. However, it failed to demand multinationals to take the technical and financial responsibility for their waste.

The banned chemical pesticides like deildin, organo chlorinated mercury and DDT were manufactured and exported to Nepal by multinationals like Bayer, Hoechst, Sandoz (now Novartis), Shell, Sumitomo (Japan), Union Carbide (now Dow) and Monsanto among others, according to the activists.

The Food and Agriculture Organisation (FAO) estimates that half a million tons of spoiled pesticides are in storage world-wide. The pesticides are inadequately stored in rusty containers and have torn packages. Experts claim that if those warehouses accidentally catch fire or flood occurs, then it will contaminate the environment and destroy livestock. It can also be a great threat to humans.

"These deadly substances should be repackaged immediately. If this warehouse in Khumaltar catches fire, it can pose a serious threat to the Kathmanduites," asserted Berstorff.

(See *Greenpeace* page 8)

नेपालमा सर्वाधिक बिक्री हुने

नेपाली राष्ट्रिय दैनिक

कान्तिपुर

७ असोज २०५८ शनिवार आश्विन कृष्ण एकादशी

KANTIPUR, Nepali National Daily, Saturday, October 13, 2001

आँखाले नदेखिने धूलोका कण उपत्यकामा मापदण्डभन्दा पाँच गुणा बढी

वायुप्रदूषणको सबैभन्दा खतरनाक तत्त्व सोझै फोक्सोमा

■ सुबोध गौतम

काठमाडौं

सवारी साधन, कलकारखाना, बसोवास र व्यवसायबाट निस्कने १० माइक्रोमिटरभन्दा साना धूलोका कण उपत्यकामा भयावह रूपमा वृद्धि हुँदै गएकाले सर्वसाधारणको स्वास्थ्यमा प्रतिकूल असर पार्दै छ । विश्व स्वास्थ्य संगठनले सार्वजनिक गर्न लागेको प्रतिवेदन र यसअघिका अध्ययनले सहरमा नाङ्गा आँखाले सजिलै ठम्याउन नसकिने दूषित धूलोका कण बढ्दै गएको देखाएका छन् ।

धूलोका त्यस्ता कण नाकभित्रका रौंमा पनि रोकिदैनन् । सीधै श्वासनली हुँदै फोक्सोमा पुग्छन् । जाडो महिनामा अझै तीव्र रूपमा सताउने यी कणबाट सिर्जित दम, ब्रोङ्काइटिस, न्युमोनिया, लहरेखोकी, रुघाखोकी र आँखासम्बन्धी रोगको उपचारमा उपत्यकावासीले वार्षिक ३ देखि ५ करोड रुपैयाँ खर्च गर्ने गरेको विश्व स्वास्थ्य संगठनले जनाएको छ । नाकका रौंले सजिलै छान्न नसक्ने धूलोका कण अहिले उपत्यकाको वायुप्रदूषणको सबैभन्दा बढी खतरनाक तत्त्व रहेको सम्बन्धित विज्ञ र उनीहरूले गरेको अध्ययनले बताएका छन् ।

'धूलो र धूवाँले साइकल चलाउन पनि गाह्रो भइसक्यो,' नौ वर्षदेखि उपत्यकामा साइकल चलाउँदै आएका सम्पन्न परिवारका वातावरणवादी युवा भूषण तुलाधरले भने । उनका अनुसार सयौंमा धूलोका कण दिन-प्रतिदिन बढ्दै गएका छन् ।

धूलोले मानवशरीरमा पारेको असरबारे संगठनले केही दिनमै सार्वजनिक गर्ने प्रतिवेदनमा उपत्यकाका प्रमुख क्षेत्रमा १० माइक्रोमिटर (पीएम-टेन) भन्दा साना कणको मात्रा मापदण्डभन्दा बढी पाइएको उल्लेख छ । तीन संस्थाले बेग्लाबेग्लै गरेको स्थलगत परीक्षणलाई आधार मानी प्रतिवेदन तयार गर्न लागिएको हो ।

'उपत्यकाको वायुप्रदूषणमा सबैभन्दा बढी खतरनाक धूलोका कण नै देखिए,' प्रतिवेदनलाई अन्तिम रूप दिने तयारीमा जुटेका एक वातावरणविद्ले भने, 'प्रदूषण वर्तमान स्थितिमा नियन्त्रण गरिएन भने सर्वसाधारणले स्वास्थ्य क्षेत्रमा करोडौं रुपैयाँ खर्च गर्नुपर्नेछ ।'

प्रतिवेदनको तथ्यांकअनुसार पुतलीसडक, चाबहिल, पाटन र पकनाजोलमा पीएम-टेनको मात्रा अत्यधिक छ । माघ, फागुन, चैत र वैशाखमा गरिएको परीक्षणअनुसार पुतलीसडकमा प्रतिघनमिटर २ सय १० माइक्रोग्रामदेखि ३ सय ७५ माइक्रोग्राम हाराहारीमा १० माइक्रोमिटरभन्दा साना कण पाइएका छन् जुन संगठनको मापदण्डभन्दा पाँच गुणा बढी हो । पाटनमा प्रतिघनमिटर ३ सयदेखि ३ सय ५० माइक्रोग्राम र चाबहिलमा २ सय ८० माइक्रोग्राम पाइएको छ । भक्तपुर र कीर्तिपुरमा संगठनको मापदण्डको हाराहारीमा छ । विश्व स्वास्थ्य संगठनको निर्देशक मापदण्ड भने प्रतिघनमिटर ७० माइक्रोग्राम छ ।

वातावरणविद् डा. तोरण शर्माले संगठनको मापदण्डअनुसार प्रत्येक २४ घन्टामा १३ सय माइक्रोग्राममम्म धूलोका कण लिए त्यसले मान्छेसको स्वास्थ्यमा कुनै असर नपार्ने बताए । 'तर उपत्यकावासीले मापदण्डभन्दा दोब्बर धूलोका कण लिइरहेका छन् ।'

नेपाल इन्भारोमेन्ट एन्ड साइनटिस्ट सर्भिस प्रालिका प्रबन्ध निर्देशक डा. शर्माले १० माइक्रोमिटरदेखि ७ दशमलव ५ माइक्रोमिटरसम्मका कण श्वासनलीमै टाँसिने र २ दशमलव ५ माइक्रोमिटरभन्दा साना कण सीधै फोक्सोमा पुग्ने जनाए । 'सवारी साधनबाट निस्किने प्रदूषित तत्त्वमा सबैभन्दा बढी पीएम-टेन पाइयो । डिजल गाडी त पीएम-टेनको प्रमुख स्रोत नै हो,' उनले भने । अधिराज्यभर दर्ता भएका कुल ३ लाख ५ हजार ३ सय ९५ सवारी साधनमध्ये १ लाख ७१ हजार ६ सय ७८ वटा साधन उपत्यकामा छन् जहाँ प्रतिवर्ष २१ प्रतिशतका दरले सवारी साधन बढिरहेका छन् ।

विश्व बैंकले सन् १९९६ मा प्रकाशित गरेको प्रतिवेदनअनुसार पनि नेपालमा वार्षिक झन्डै २० हजार मानिस दमरोग र ५ हजार बालबालिका लहरेखोकीबाट प्रभावित हुन्छन् । वार्षिक झन्डै २१ करोड रुपैयाँ स्वास्थ्योपचारमा खर्च हुन्छ । 'यो दश वर्षपहिलेको तथ्यांक हो, अहिले त दश गुणाले बढेको छ,' स्वच्छ ऊर्जा नेपालका कार्यकारी निर्देशक रहेका तुलाधरले भने । स्वास्थ्य सेवा विभागले दुई वर्षअघि प्रकाशित गरेको तथ्यांकअनुसार बहिरङ्ग विभागमा आउने करिब ७१ लाख १६ हजार रोगीमध्ये १२ प्रतिशत श्वास-प्रश्वाससम्बन्धी रोगबाट पीडित थिए ।

काठमाडौंदेखि १२ किलोमिटर दक्षिणमा रहेको हिमाल सिमेन्ट कारखाना धूलो निकाल्ने प्रमुख स्रोत रहेको पाँच वर्षपहिलेको एक अध्ययनले देखाएको छ । सडकको स्थिति दिन-प्रतिदिन नाजुक हुँदै गएको, सवारी साधन केही खास क्षेत्रमा मात्रै एकत्रित हुने प्रवृत्तिले वायुप्रदूषणको भार बढेको तुलाधरले बताए ।

सरकारले स्वच्छ वातावरणमा खर्च गर्न २०५६/५७ को बजेट भाषणमार्फत उपत्यकामा प्रतिलिटर पेट्रोल र डिजेलमा ५० पैसा प्रदूषण कर लिने व्यवस्था गरे पनि त्यो अहिलेसम्म लागू भएको छैन । उपत्यकाको सन् १९९७ को इन्धन खपतको अवस्था हेर्ने हो भने करवापत करिब साढे छ करोड रुपैयाँ संकलन हुन्छ । 'करवापत उठेको रकम वातावरण सुधारमा खर्च गर्न सकिन्छ,' तुलाधरले भने ।

काठमाडौंको भौगोलिक बनावट कचौरा आकारको भएकाले जाडोमा पीएम-टेन बढ्ने तुलाधर बताउँछन् । 'जाडोमा पानी नपर्ने र हावाको गति अत्यन्त कम हुने हुँदा हावा माथि जान सक्दैन र धूलोका कण जहाँको त्यहीं धेरै दिनसम्म रहन्छन् ।'

नेपाली राष्ट्रिय दैनिक

कान्तिपुर

२ असोज २०५८ शुक्रवार आश्विन कृष्ण तृतीया

KANTIPUR, Nepali National Daily, Friday, October 5, 2001

प्रदूषण परीक्षणमा धेरै सवारी असफल

■ सुबोध गौतम

काठमाडौं

मापदण्डबाहिरका सवारीलाई विभिन्न प्राविधिक उपायद्वारा प्रदूषण परीक्षणमा उत्तीर्ण गराउने राजधानीका पेट्रोलचालित सवारी चालकहरू सरकारले हाइड्रोकार्बनसमेत जाँच्ने उपकरण ल्याएपछि परीक्षणमा असफल भइरहेका छन् । यसअघि कार्बनडाइअक्साइडको मात्रामात्र परीक्षण गर्ने गरिन्थ्यो ।

पहिले उनीहरूले साधन परीक्षणमा ल्याउनुअघि वर्कसपमा इन्जिन मिलाएर आउँथे', उपत्यकाका ट्राफिक प्रहरी कार्यालयका डीएसपी दीपकबहादुर श्रेष्ठ भन्छन्- 'चालकले कार्बनमनोअक्साइडको मात्रा कम गर्न हावाको चाप बढाएर इन्जिनमा जाने इन्धनको मात्रा घटाउँथे ।'

वायु प्रदूषणका जानकार विमल अर्यालका अनुसार कार्बनमनोअक्साइड घटाउँदा हाइड्रोकार्बन बढ्छ, हाइड्रोकार्बन घटाउँदा कार्बनमनोअक्साइड बढ्छ । अबको उपकरणले परीक्षण गर्दा मिसावटयुक्त तेल प्रयोग गर्ने र समयमा मर्मतसम्भार नगर्ने सवारी साधन कुनै हालतमा उत्तीर्ण नहुने उनको दाबी छ ।

पुरानो उपकरणले भदौको अन्तिम दुईसाता र नयाँले असोज सुरुका दुईसाता गरिएको परीक्षणमा पहिलेको तुलनामा हाल २ सय ४० प्रतिशतले सवारी साधन असफल भए । पहिलोमा ११ सरकारी सवारीमध्ये २ र १ सय ८१ भाडाका सवारीमध्ये ३१ असफल भए भने नयाँ उपकरणले २४ सरकारीमा ११ र ६ सय ५६ भाडा साधनमध्ये २ सय ४६ बटा पास हुन सकेनन् । पर्यटक, निजी र संस्थानका सवारी साधन पनि त्यही हाराहारीमा समातिए ।

डीएसपी श्रेष्ठका अनुसार परीक्षणमा दैनिक आउने सवारीमध्ये ४५ देखि ५० प्रतिशत असफल हुने गरेका छन् । ट्राफिक कार्यालयले असोज १ देखि नयाँ उपकरण प्रयोग गरी कार्बनडाइअक्साइडसहित हाइड्रोकार्बनको मात्रा पनि परीक्षण गर्न थालेको हो ।

वातावरणविद्हरूले हाइड्रोकार्बन र कार्बनमनोअक्साइडको मात्रा एकैपटक परीक्षण गर्नुपर्ने माग राखेपछि सरकारले गत वर्ष कात्तिक ७ गतेको राजपत्रमा सूचना प्रकाशित गरी ग्यास तथा पेट्रोलचालित सवारी साधनका लागि हाइड्रोकार्बनको मात्रा चार पाङ्ग्रेको हकमा १ हजार पीपीएम तथा तीन र दुई पाङ्ग्रेको हकमा ७ हजार ८ सय पीपीएमभित्र हुनुपर्ने व्यवस्था गरेको हो ।

अर्यालका अनुसार सवारी धनीहरूले वर्कसपकै चालक ल्याएर साधन परीक्षण गराउँछन् । उनीहरूलाई उत्तीर्ण गराएबापत दुई सयदेखि पाँच सय रुपैयाँ कबोलिएको हुन्छ । कार्यालयमा परीक्षण गरेपछि फेरी बाटोमा गुडिरहेको बेला परीक्षण गर्नुपर्ने उनको तर्क छ । तर, यो सम्भव छ त ? 'पर्याप्त कर्मचारी नहुँदा परीक्षण व्यवस्थित गर्न नसकिएको हो', डीएसपी श्रेष्ठ भन्छन्- 'यसका लागि अहिले हामीसँग सात प्रहरीमात्र छन् । यतिले सबैतिर कसरी भ्याउने ?'

भाडाको सवारी साधन छ/छ महिना र अन्य सबै किसिमका साधनले एक/एक वर्षमा प्रदूषण परीक्षण गराउनुपर्ने व्यवस्था छ । वातावरणविद्हरू यो अवधि ३ महिना हुनुपर्ने बताउँछन् ।

ट्राफिक कार्यालयले यसअघि 'होरिबा' नामक पुरानो उपकरण प्रयोगमा ल्याएको थियो भने हाल प्रदूषण परीक्षणमा फ्रान्समा निर्मित 'बोच' ल्याइएको छ । उक्त उपकरण वातावरण मन्त्रालयमार्फत 'डानिडा' सरकारले उपलब्ध गराएको हो । 'पहिलेको उपकरण धेरै पुरानो थियो र मरम्मत सम्भार पनि थिएन, त्यसैले सबै साधन परीक्षणमा सफल भए', अर्यालले भने ।

परीक्षणमा सफल सवारी साधनलाई हरियो र असफल हुनेलाई रातो स्टिकर दिने व्यवस्था छ । रातो स्टिकर प्राप्तलाई पुतलीसडक, न्यूरोड, एयरपोर्ट, सिंहदरबार, दरबारमार्ग र हनुमानढोका क्षेत्रमा प्रवेश निषेध छ । ०५२ जेठ २३ गते (विश्व वातावरण दिवस) देखि वायु उत्सर्जन मापदण्डअनुसार परीक्षण गरी स्टिकर वितरण गरिएको हो ।'

नेपालमा सर्वाधिक बिक्री हुने

नेपाली राष्ट्रिय दैनिक

कान्तिपुर

२० असोज २०५८ शनिवार आश्विन कृष्ण तृतीया

KANTIPUR, Nepali National Daily, Saturday, October 6, 2001

तराईका तीन जिल्लामा 'रोलब्याक मलेरिया' कार्यक्रम लागू गरिने

कान्तिपुर समाचारदाता———

भद्रपुर, १९ असोज- पुनः देखापर्न थालेको मलेरिया रोग नियन्त्रणका लागि आगामी पुसदेखि झापालगायत तराईका धनुषा र कञ्चनपुरसमेत तीन जिल्लामा 'रोलब्याक मलेरिया' कार्यक्रम लागू गरिने जिल्ला जनस्वास्थ्य कार्यालय झापाले जनाएको छ।

जिल्ला जनस्वास्थ्य कार्यालयका मलेरिया शाखा हेर्दै आउनुभएका भेक्टर कन्ट्रोल सहायक केदारनाथ साहका अनुसार कार्यक्रम सुरु गर्न अन्तिम तयारी भइरहेको छ र जिल्लाका मलेरिया प्रभावित १० गाविसमा यो कार्यक्रम लागू हुनेछ।

पहिले मलेरिया उन्मूलन गरिए पनि पुनः उल्लेखनीय रुपमा देखा पर्न थालेपछि त्यसलाई पुनः उन्मूलन गर्नुलाई 'रोलब्याक मलेरिया' भनिएको हो। अधिराज्यका ६४ जिल्लामा कुनै न कुनै रुपमा मलेरिया पाइए पनि तराईका २० जिल्लामध्ये उपरोक्त तीन जिल्लालाई संवेदनशील मानेर विश्व स्वास्थ्य संगठनले प्राथमिकताभित्र राखी त्यो कार्यक्रम सुरु गर्न लागेको हो।

ती दश गाविसमा महेन्द्र राजमार्गसँग जोडिएका अथवा नजिक रहेका बाहुनडाँगी, शान्तिनगर, अनारमनी, गरामनी, तोपगाछी, लखनपुर, सतासीधाम, तुरुङ्गा र जमलसंग जोडिएका जलथल र खुदुनाबारी रहेका छन्।

पहिले मलेरिया उन्मूलन गरिए पनि पुनः उल्लेखनीय रुपमा देखा पर्न थालेपछि त्यसलाई पुनः उन्मूलन गर्नुलाई 'रोलब्याक मलेरिया' भनिएको हो।

अधिराज्यका ६४ जिल्लामा कुनै न कुनै रुपमा मलेरिया पाइए पनि तराईका २० जिल्लामध्ये उपरोक्त तीन जिल्लालाई संवेदनशील मानेर विश्व स्वास्थ्य संगठनले प्राथमिकताभित्र राखी त्यो कार्यक्रम सुरु गर्न लागेको हो।

झापामा आज २०५७।५८ मा [illegible] गएका शंकास्पद ७ हजार १ [illegible] रोगीको रगत परीक्षण [illegible] गरिएको [illegible] तर्फ ३ सय ३३ विरामी र प्लाज्मोडियम फाल्सिफोरसतर्फ १ सय २७ गरी ४ सय ५० जनामा मलेरिया देखिएको थियो। लामखुट्टेका कारण सर्ने यो रोग विशेष गरी गर्मी याममा बढी देखापर्ने गरेको छ।

झापाको पनि धूलाबारी क्षेत्रका शान्तिनगर, बाहुनडाँगी, धाइजन र मेची नगरमा गत वर्ष २ सय १२ जना औलोका रोगी फेला परेका थिए।

त्यसपछि दमक क्षेत्रमा यस रोगको प्रभाव बढी देखिएको छ। गत वर्ष औलो रोगका कारण झापामा ३ जनाको मृत्यु भएको थियो।

रोलब्याक मलेरिया कार्यक्रमअन्तर्गत ती क्षेत्रमा मलेरियाविरुद्ध औषधि छर्कने, चेतनामूलक कार्यक्रम गर्ने र विरामीलाई औषधि खुवाई रोग फैलन नदिने प्रयत्न गरिनेछ।

झापामा खासगरी भारतको आसाम, मणिपुर र मिजोरम क्षेत्रबाट आउनेहरुबाट मलेरिया रोग प्रवेश गर्ने भन्ने गरेको काँकडा वा हात्याभा चेक जाँचको व्यवस्था गर्नुपर्ने स्थानीयवासी बताउँछन्।