Kathmandu Valley Environment Outlook

ICIMOD

MoEST/GoN

UNEP

About the Organisations

International Centre for Integrated Mountain Development

The **International Centre for Integrated Mountain Development** (ICIMOD) is an independent 'Mountain Learning and Knowledge Centre' serving the eight countries of the Hindu Kush-Himalayas – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and the global mountain community. Founded in 1983, ICIMOD is based in Kathmandu, Nepal, and brings together a partnership of regional member countries, partner institutions, and donors with a commitment for development action to secure a better future for the people and environment of the extended Himalayan region. ICIMOD's activities are supported by its core programme donors: the governments of Austria, Denmark, Germany, Netherlands, Norway, Switzerland, and its regional member countries, along with over thirty project co–financing donors. The primary objective of the Centre is to promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations.

United Nations Environment Programme

Established in 1972 and based in Nairobi, Kenya, the **United Nations Environment Programme** (UNEP) is the voice for the environment within the United Nations system. The Executive Director is Achim Steiner.

UNEP's mission is to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations. Acting as a catalyst, advocate, educator and facilitator to promote the wise use and sustainable development of the global environment, UNEP works with numerous partners within the United Nations, as well as with national governments, international and non-governmental organisations, the private sector and civil society. UNEP assesses global, regional and national environmental conditions and trends; develops international and national environmental instruments; helps to strengthen institutions for the wise management of the environment; facilitates the transfer of knowledge and technology for sustainable development, and encourages new partnerships and mind-sets within civil society and the private sector.

To ensure its global effectiveness, UNEP has six regional offices: in Africa; West Asia; Asia and the Pacific; North America; Latin America and the Caribbean; and Europe. UNEP can be reached at www.unep.org

Ministry of Environment, Science, and Technology

The **Ministry of Environment, Science and Technology** (MoEST) was established in 2005, when the environment functions of the previous Ministry of Population and Environment (MoPE) were transferred to the then Ministry of Science and Technology. The Ministry of Population and Environment had been created in 1995, building on the previous Ministry of Forest and Environment, the first environment ministry in Nepal set up in 1991.

The main objectives of MoEST are to promote environmentally sustainable economic development of the country, promote a natural and cultural and environment, to protect life support systems, identify new technologies through the development and promotion of research activities in the field of environment, science and technology, contribute to achieving national objectives related to poverty alleviation by developing appropriate and new technologies through research, develop and promote traditional indigenous technologies, and encourage intellectual groups working in the field of environment, science, and technology by creating appropriate opportunities.

The Ministry works through three divisions – Environment, Science and Information Technology Promotion; Planning Evaluation; and Administration – and one Department (Metrology and Hydrology). Other important organs of the Ministry include the Nepal Institute for Science and Technology, the High Level Commission for Information Technology, and the Alternative Energy Promotion Development Board. The Ministry is also the focal point for various multilateral international conventions. During the short period since its establishment, the Ministry has been successful in making public some important policies and standards related to environment, science and technology.

The Ministry can be reached through its website-www.moest.gov.np and email-info@moest.gov.np.

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Editorial Team
Greta Rana (Consultant Editor)
A. Beatrice Murray (Senior Editor)
Dharma R. Maharjan (Technical Support and Layout Design)
Asha K. Thaku (Maps and Illustrations)

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Kathmandu Valley Environment Outlook

The Study Team

ICIMOD

Bidya Banmali Pradhan
Basanta Raj Shrestha

MoEST

Khum Raj Punjali
Chhewang N. Lama (Sherpa)

Consultants

Amar Bdr. Manandhar (Lead)
Kishore Thapa
Bandana Pradhan
Bhushan Tuladhar
Drona Ghimire
Gyani Raja Chitrakar

International Centre for Integrated Mountain Development (ICIMOD)
Ministry of Environment, Science and Technology (MoEST)
and
United Nations Environment Programme (UNEP)
January 2007


NEPAL
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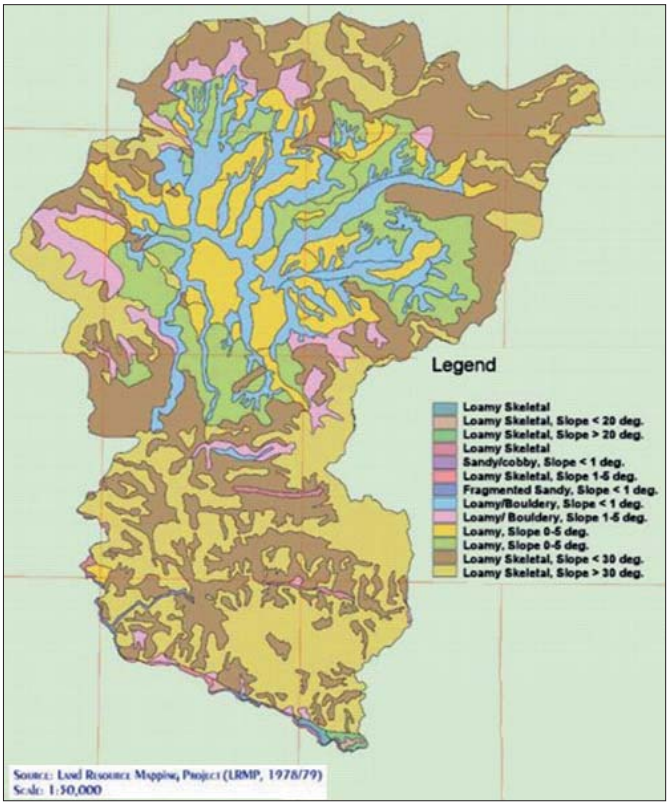
KATHMANDU VALLEY
50 25 0 50 100 150 200
Kilometers
SCALE
Source: Topographical Survey Branch
1996
Projection: Geographic
ICIMOD
MENRIS, 2007


KATHMANDU VALLEY
N
KATHMANDU
BHAKTAPUR
LALITPUR
Legend
Kathmandu Valley
District Boundary
VDC
4 2 0 4 8 12
Kilometers
SCALE
Source: Topographical Survey Branch
1996
Projection: Geographic
ICIMOD
MENRIS, 2007


Legend
Loamy Skeletal
Loamy Skeletal, Slope < 20 deg.
Loamy Skeletal, Slope > 20 deg.
Loamy Skeletal
Sandy/cobby, Slope < 1 deg.
Loamy Skeletal, Slope 1-5 deg.
Fragmented Sandy, Slope < 1 deg.
Loamy/Bouldery, Slope < 1 deg.
Loamy/ Bouldery, Slope 1-5 deg.
Loamy, Slope 0-5 deg.
Loamy, Slope 0-5 deg.
Loamy Skeletal, Slope < 30 deg.
Loamy Skeletal, Slope > 30 deg.
Source: Land Resource Mapping Project (LRMP, 1978/79)
Scale: 1:50,000

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Foreword

Director General
International Centre for Integrated Mountain Development

Forty or fifty years ago, every pupil in the English-medium education system knew the phrase, "And the wildest dreams of Kew are the facts of Kathmandu" from one of Kipling's poems. The famous phrase gave an impression of a peaceful valley of dreams, a place of great natural and cultural beauty.

The Kathmandu valley is still a place of extraordinary natural and cultural beauty. But for those of us who were here over forty years ago, it is a valley transformed almost beyond recognition. Constantly growing traffic congestion, polluted air from vehicles and brick factories, rapidly expanding urban sprawl, streams and rivers that too often resemble sewers, piles of garbage and shortages of drinking water too often obscure the beauty beneath and beyond – the rice paddies and mustard fields still found reflecting the pagodas and high Himalaya beyond.

The present publication provides a detailed account of the status of the Kathmandu Valley environment. The report highlights the five key environmental issues of air quality, settlement, drinking water, waste management, and natural disaster preparedness, reviews their status, and recommends measures to prevent or minimise the negative impacts. The report provides direct options for management by various levels of government, civil society, the public-private sector and residents. These include improved planning and zoning, land pooling, solid waste management, rainwater harvesting, a variety of infrastructural and technical measures and vastly improved coordination and enforcement. Community mobilisation is critical to achieving these goals. With the potential for catastrophic disaster from earthquakes, many of these measures are not only important for human health, tourism development and the quality of life – but essential to the preservation of life when the inevitable earthquakes occur.

ICIMOD has been pleased to partner with the United Nations Environment Programme (UNEP) and the Ministry of Environment, Science and Technology of the Government of Nepal (MoEST) in preparing this report. It builds on previous collaborations that resulted in the Kathmandu Valley GIS Database published in 2000; the Nepal State of the Environment report, prepared by ICIMOD and published by UNEP in 2001; and the joint ADB/ICIMOD Environment Assessment of Nepal published in 2006. ICIMOD is particularly grateful to Mr. Surendra Shrestha, Regional Director, UNEP Regional Office for Asia and the Pacific for his strong support and close partnership throughout all of these efforts. We also thank Mr. Bal Krishna Prasai, Secretary, Mr. Khum Raj Punjali, Joint Secretary, and Mr. Chhewang Lama, Agricultural Officer, from MoEST and their colleagues for their contributions to the research and preparation of this report. Special thanks go to the numerous thematic experts who developed and contributed to the different chapters.

It is always easier to report on the environment than to act. We need both, and I encourage all of us to take up the concomitant action so desperately needed. Kathmandu is indeed an extraordinarily special place worth all of our effort to keep it a place of both our homes and our dreams.

J. Gabriel Campbell
Director General, ICIMOD
January 2007

Foreword

Executive Director
United Nations Environment Programme

The United Nations Environment Programme (UNEP) is mandated to regularly assess major environment developments and trends. This mandate has been practically implemented through the Global Environment Outlook (GEO) process with global, regional, sub-regional, national and even city-level assements. The GEO process is participatory, consultative and features capacity building at its core. This gives GEO assessments the necessary scientific accuracy, credibility, and authority to provide information for environmental management and policy development to a wide target audience.

The capacity building programme of the GEO process has been highlighted in the Bali Strategic Plan for Technology Support and Capacity Building, an agreed intergovernmental framework to strengthen capacity and provide technology support to developing countries and countries with economies in transition. The implementation of the Bali Strategic Plan is an important opportunity for UNEP to work with partners to strengthen national structures for environmental reporting as a basis for decision making.

Kathmandu Valley Environment Outlook is one of the outputs of UNEP's capacity building programme. The report identifies key environmental issues for Kathmandu Valley, including air quality and traffic management, unplanned settlement, degradation of water resources, waste management, and natural disaster preparedness. These issues have been analyzed by various experts, including national and city officials, scientists, academics, and civil society representatives, to determine their policy making implications. This broad-based participatory process brings national environmental issues to the attention of different stakeholders to the general public.

I hope this report will provide a sound basis for decision-making by the Government of Nepal and Kathmandu Valley Municipalities in addressing environmental issues at the policy level and in advancing the sustainable development agenda of the valley's settlements. UNEP has also been assisting the Government of Nepal to conserve the environment with collaborative activities on environmental monitoring and early warning, capacity building, and raising of environmental awareness. I would like to express my gratitude to the Government of Nepal, International Centre for Integrated Mountain Development (ICIMOD), and associated experts for this fruitful collaboration.

Achim Steiner
United Nations Under-Secretary General and Executive Director
United Nations Environment Programme
January 2007

Foreword

State Minister

Ministry of Environment, Science, and Technology

I am delighted to be able to release this report *Kathmandu Valley Environment Outlook* on the occasion of the South Asia Cooperative Environment Programme's (SACEP) 10th Governing Council Meeting 2007, in Kathmandu, Nepal.

I believe that this report has successfully focused on the emerging environmental issues of Kathmandu Valley, particularly in the fields of air pollution, water quality, urban settlement, waste management and natural disaster as well as institutional setting, including social, economic and political context of the valley. The report will serve as an instrument to reflect how, why, when and what factors influenced the transformation of the state of the environment in Kathmandu Valley and how one issue can be addressed.

Over the last decade and a half, Kathmandu Valley has experienced various environmental problems, particular the rapid growth of population, urbanisation, unplanned settlement, inadequate management of waste, increase of vehicles and emissions, traffic congestion and inadequate preservation of water bodies. The Ministry has developed a vision to address the problems across the country and to take major action towards conserving and protecting the country's environmental resources, with the aim of attaining environmentally sustainable development of the state. We have realised that appropriate capacities are essential to deal with the situation to enable a balance to be achieved among the social, economic and ecological systems for the establishment of environmentally sustainable development without creating an adverse impact on environmental services, and still providing an equal opportunity to the coming generations to have access to the environmental resources.

The Ministry has recognized that it is necessary to have partnership arrangements to deal with environmental issues through collective efforts, and has formed a strategic partnership with UNEP to implement various environmental programmes and activities in collaboration with ICIMOD. UNEP has been particularly supportive in implementing a number of programmes and projects in transboundary air pollution, including the Malè Declaration and Atmospheric Brown Cloud, the Nepal Biodiversity Year Book, promotion of environmental education and the current publication on Kathmandu Valley environment.

I strongly believe that this report will provide a significant reference document for all institutions and individuals involved in the field of environment management in the valley. The Ministry greatly acknowledges the contribution of UNEP and especially Mr. Surendra Shrestha, Regional Director, of UNEP ROAP in supporting the preparation of this report and of ICIMOD for facilitating the process especially technical input by Ms. Bidya Banmali Pradhan and Mr. Basanta Shrestha and support by the Publications Unit in bringing out the report. I also extend my thanks to those involved in the preparation of the report including our Joint Secretary, Mr. Khum Raj Punjali and Dr. Chhewang Lama, Agricultural Officer, who were also in the review committee that provided valuable inputs in shaping the report in its present form.

Man Bahadur Biswokarma
Honourable State Minister
Ministry of Environment, Science and Technology
January 2007

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ICIMOD would like to thank the many individuals and institutions who contributed to the preparation of the Kathmandu Valley Environment Outlook, and especially the many institutions and individuals who provided data from their own records.

Our sincere thanks go to the consultants who prepared specific chapters – Amar Manandhar of Seed Nepal (Chapters 1,2 and 4), Bhushan Tuladhar of ENPHO (Chapter 3), Bandana Pradhan (Chapter 4), Drona Ghimire (Chapter 5), Kishore Thapa (Chapter 6), and Gyani Raja Chitrakar and Birendra Piya (Chapter 7) – as well as to Bidya Banmali Pradhan and Amar Manandhar who were responsible for the overall compilation and editing of the report. The overall guidance from Basanta Shrestha and Bidya Banmali Pradhan from ICIMOD, and from Khum Raj Punjali and Chhewang Lama from the Ministry of Environment, Science and Technology, who reviewed the report, is also deeply appreciated.

This study could not have been prepared without the continuing support and encouragement of the United Nations Environment Programme, Regional Resource Centre for Asia and the Pacific in Bangkok, and especially the Regional Director of the Regional Office for Asia and the Pacific, Surendra Shrestha.

A picture speaks a thousand words, we thank the many individuals and organisations who provided photographs illustrating the report. We have tried to credit all sources and apologise if any were overlooked.

This report relied heavily on input from the staff of ICIMOD's MENRIS Division, in particular Pradeep Dangol who compiled the graphs, Govinda Joshi who compiled and/or prepared the maps, and Monica Moktan who provided administrative support and acted as rapporteur during the consultation meeting.

The extensive input from ICIMOD's Information Management, Communications and Outreach Division is gratefully acknowledged, especially A. Beatrice Murray, Senior Editor, Dharma R. Maharjan, who worked extensively to complete the layout and design on time, Asha Kaji Thaku, cartographer/artist, who helped with the figures, layout, and final proofing, and Anjesh Tuladhar who uploaded the report in Wiki form so that the group could work together more easily after the first draft consultation. The work of the consultant editor, Greta Rana, was crucial in preparing the publication.

Executive Summary

The purpose of the 'Kathmandu Valley Environment Outlook' is to examine the current status of the environment of the Kathmandu Valley and the suburban areas of Kathmandu, Lalitpur, and Bhaktapur districts. The report analyses the emerging environmental problems and promotes specific recommendations for future action. The analysis uses UNEP'S adaptation of OECD's Driver-Pressure-State-Impact-Response (DPSIR) framework.

The two chapters in the first Section provide an overview of the historical factors and set the stage for assessing the key environmental issues in the five chapters of the second section. This analysis presents an alarming picture of a rapidly deteriorating environment. The last section summarises the analyses and identifies a number of measures for amelioration of existing problems and prevention of future deterioration.

In Chapter 1, the Kathmandu valley settlement has been traced back to 900 B.C. A rich cultural heritage has been provided through a succession of farmer kings, the development of Kathmandu as a trade entrepôt between Tibet and the states of the Indian sub continent, and the enrichment of the valley through craftsmanship and architectural monuments. Chapter 2 on social and economic factors provides a demographic profile of the subsequent urban growth and the impact of increases in transient and migrant populations. The growth of employment and education lead to an exponential rise in population and an increase in the numbers of urban poor. Infrastructure is now overloaded and poor service delivery is related to a number of issues including poor coordination.

On the topic of air quality and traffic management, Chapter 3 cites increasing affluence, rapid urbanisation, Kathmandu-centric development, and poor infrastructural capacities as key elements in the rise in air pollution. The main contributor is identified as vehicular emissions. There are increasingly negative impacts on health, especially in the form of chronic obstructive pulmonary disease (COPD). In Chapter 4, the settlement pattern is described as growing haphazardly with the tremendous increase in population. In-migration and the rapid population growth rate are driving factors leading to unprecedented land subdivision and construction in rural areas where there is insufficient infrastructure. Chapter 5 discusses the extensive deterioration in river water quality in urban areas due to excessive pollution loads. Increasing demands for drinking water place a heavy strain on insufficient supplies. Chapter 6 then describes the problems in the management of solid waste, and the negative impacts of waste and pollution on health. Earthquakes and landslides are identified as the two most prominent potential natural disasters in the Kathmandu Valley in Chapter 7. The location of the valley in a seismic zone, lack of public awareness about earthquakes, lack of adequate planning, and lack of coordination are the main factors that impact negatively on disaster preparedness. Excavation of slopes, deposition of loads on slopes, deforestation, irrigation, mining, and water leakage are the main human activities causing landslides.

In the last section, Chapter 8 provides recommendations for policies related to the five issues under analysis. These include incentives for electric vehicles and improved emission testing; effective urban planning; and air quality governance. An urban land-use and management policy for the Kathmandu Valley, along with land zoning and encouragement of infrastructural planning and construction through land-pooling projects, is seen as a sine qua non for the future of the valley. Among the many recommendations for water quality and drinking water resources are the involvement of communities in water resource planning and the biological treatment of water. Rainwater harvesting should be encouraged and water-saving practices promoted. Waste management recommendations start with the need for a basic clarification in the roles of all the agencies involved; promotion of composting, reuse, and recycling; improvement in facilities and wastewater treatment plants; and strong compliance monitoring. Finally, recommendations related to natural disaster preparedness include strengthening the existing institutions, enforcing building codes, and promoting awareness and emergency planning.

All of the recommendations are well within Nepal's means at this point in time. The report comes at an important watershed in the nation's history when many changes are being made. The report holds out the hope that with proper concerted planning and implementation of the recommendations, the Kathmandu Valley could still be a Shangri La in the middle of the Himalaya and contribute to meeting the millennium goals for the environment by 2015.

Acronyms and Abbreviations

ADB	Asian Development Bank
AQM	air quality management
BKM	Bhaktapur Municipality
CBD	Convention on Biological Diversity
CBS	Central Bureau of Statistics
CEN	Clean Energy Nepal
CKV	Clean Kathmandu Valley
COPD	chronic obstructive pulmonary disease
CWTP	combined wastewater treatment plant
DDC	district development committee
DMG	Department of Mines and Geology
DoTM	Department of Transport Management
DPSIR	Driver-Pressure-State-Impact-Response
DUDBC	Department of Urban Development and Building Construction
DWSS	Department of Water Supply and Sewerage
ECONSAN	ecological sanitation
EIA	environmental impact assessment
EMP	environment management plan
EMS	environmental management system
ENPHO	Environment and Public Health Organisation
EPA	Environment Protection Act
EPC	Environment Protection Council
EPR	Environment Protection Regulations
ESPS	Environment Sector Programme Support
GPS	global positioning system
GTZ	German Agency for Technical Cooperation
HCI	health care institution
ICIMOD	International Centre for Integrated Mountain Development
IDNDR	International Decade for Natural Disaster Reduction
IUCN	The World Conservation Union
JICA	Japan International Cooperation Agency
KMC	Kathmandu Metropolitan City
KRM	Kirtipur Municipality
KUDP	Kathmandu Urban Development Project
KVEO	Kathmandu Valley Environment Outlook
KVMP	Kathmandu Valley Mapping Programme
KVTDC	Kathmandu Valley Town Development Committee
LSGA	Local Self-Governance Act
LSMC	Lalitpur Sub Metropolitan City
MBT	Main Boundary Thrust
MCT	Main Central Thrust
MDG	Millennium Development Goals
MFT	Main Frontal Thrust
MHPP	Ministry of Housing and Physical Planning
MHT	Main Himalayan Thrust
MoAC	Ministry of Agriculture and Cooperatives
MoEST	Ministry of Environment, Science and Technology
MoF	Ministry of Finance

MoFSC	Ministry of Forest and Soil Conservation
MoI	Ministry of Industry
MoICS	Ministry of Industry, Commerce and Supplies
MoLD	Ministry of Local Development
MoPE	Ministry of Population and Environment
MoWR	Ministry of Water Resources
MPPW	Ministry of Physical Planning and Works
MTM	Madhyapur Thimi Municipality
NBSM	Nepal Bureau of Standards and Metrology
NEPAP	Nepal Environment Policy and Action Plan
NESS	Nepal Environmental and Scientific Services
NHRC	National Health Research Council
NLSS	Nepal Living Standards Survey
NPC	National Planning Commission
NSC	National Seismological Centre
NSET	National Society for Earthquake Technology
NTC	Nepal Telecommunication Corporation
NWP	National Water Plan
NWRS	National Water Resources Strategy
NWSC	Nepal Water Supply Corporation
PEER	Programme for Enhancement of Emergency Response
SDC	Swiss Development Cooperation
SEED Nepal	Society for Environment and Economic Development Nepal
SWC	Social Welfare Council
SWMRMC	Solid Waste Management and Resource Mobilisation Centre
SWNCC	Social Welfare National Coordination Council
TDIC	Town Development Implementation Committee
UEIP	Urban Environment Improvement Project
UEMP	Urban Environment Management Programme
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
VDC	village development committee
WAC	Water for Asian Cities
WECS	Water and Energy Commission Secretariat
WHO GV	World Health Organisation guideline value
WHO	World Health Organisation

Scientific and temporal measurements

μg	microgram (10^{-6} gram)
$\mu g/m^3$	microgram per cubic metre
A.D.	(Anno Domini) of the Christian era
B.C.	before Christ
B.S.	Bikram Sambat (era used in Nepal)
BOD	biological oxygen demand
CNG	compressed natural gas
CO	carbon monoxide
COD	chemical oxygen demand
DO	dissolved oxygen
HC	hydrocarbon
HSU	Hartridge smoke unit

LPG	liquefied petroleum gas
mld	million litres per day
MMI	modified Mercalli intensity
NAAQS	national ambient air quality standards
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
PAH	polycyclic aromatic hydrocarbon
$PM_{2.5}$	particulate matter of diameter 2.5 microns or less
PM_{10}	particulate matter of diameter 10 microns or less
POP_s	persistent organic pollutants
SWQ	saprobic water quality
SODIS	solar disinfection
SOx	sulphur oxides
SO_2	sulphur dioxide
TDS	total dissolved solids
TSP	total suspended particles
TSS	total suspended solids

Currency Equivalent

In this report all references to rupees (Rs) are to Nepalese rupees

Currency Unit – Nepalese rupees (NRs)
$1 = NRs 70.60
(As of 2 January 2007)

Notes

(i) The Nepalese calendar year (B.S.) runs from mid April to mid April. Unless otherwise stated, year ranges written in the form 2005/06 denote a single calendar year.
(ii) The fiscal year (FY) of the Government ends on 15 July. FY before a calendar year denotes the year in which the fiscal year ends. (For example, FY2000 begins on 16 July 1999 and ends on 15 July 2000.)
(iii) In this report, $ refers to US dollars.
(iv) In this report, tons (t) refer to metric tons or tonnes (1,000 kg).
(v) Acts and Regulations are cited under the name of the ministry from which they originate. The official version of Acts and Regulations is published in the Nepal Gazette (in Nepali). Some Acts and Regulations are published by other Government agencies in English (unofficial translations).