

Regional Cooperation for
Flood Disaster Mitigation
in the Hindu Kush-Himalayan Region
Technical Papers

Kathmandu, Nepal, March 2003



Partnership Platforms 3/03 (Supp.)

Supplement

about the organisations

ICIMOD

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 the future of the Hindu Kush-Himalayas. The primary objective of the Centre is to promote the development of economically and environmentally sound mountain ecosystems and to improve the living standards of mountain populations.

WMO

The **World Meteorological Organization (WMO)** is the specialised agency of the United Nations system responsible for monitoring and forecasting the state of the world's atmosphere, climate and water resources. In the field of freshwater, its stated aim is "to apply hydrology to meet the needs for sustainable development and use of water and related resources; to the mitigation of water-related disasters; to ensure effective environmental management at national and international levels."

The Organization has its origins in the 1860s and operates on the basis of cooperative action by the National Meteorological and Hydrological Services of its Member countries and territories, which numbered 186 in June 2003.

While WMO's principal contacts are with the National Meteorological and Hydrological Services of countries, its collaborative work embraces joint projects with many other intergovernmental and non-governmental organisations and regional bodies. It receives support from a wide range of donor institutions and countries. This also involves participation in many high-level intergovernmental meetings and programmes. Whether at the local level or intergovernmental level, WMO's aim is to help countries develop the knowledge base that they need to manage their water resources and combat the threats of flood and drought.

USDS/REOSA

The **Department of State's Regional Environment Office for South Asia** supports transboundary cooperation in dealing with environmental, other scientific and health challenges among the countries of South Asia. Water issues are a major focus of its efforts. The office is based in the U.S. Embassy in Kathmandu.

USAID/OFDA

The **United States Agency for International Development's (USAID) office of U.S. Foreign Disaster Assistance (USAID/OFDA)** is responsible for providing international disaster assistance and coordinating the U.S. government (USG) response to declared disasters in foreign countries. USAID/OFDA's Mission is to minimize and where possible, prevent loss of life, human suffering, and damage to economic assets in disaster affected countries. The sub-regional office of USAID/OFDA is based in Kathmandu.

REGIONAL COOPERATION FOR
Flood Disaster Mitigation
IN THE HINDU KUSH-HIMALAYAN REGION
Technical Papers

Report of the 2nd High Level Consultative Meeting on
Establishment of a Regional Flood Information System
Kathmandu, Nepal, 10-13 March 2003

Editor

Mandira Shrestha

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Note: The affiliation and professional positions of the various participants were those current at the time of the meeting.

Foreword*

The mountains of the Hindu Kush-Himalayas (HKH) are some of the largest storehouses of freshwater in the lower latitudes in the world and the source of many mighty rivers including the Indus, Ganges, Brahmaputra, Meghna, and Mekong. These rivers provide water for drinking and food production, and contain the potential for generating the hydropower that could improve livelihoods and support economic development throughout the region. Equally, these same rivers, untamed and uncontrolled, yearly cause such extensive floods as to threaten the lives of millions of people downstream and cause untold damage to property.

Too often, the people in the path of these floods have no warning, and in many cases it is the poorest of the poor, those with the least resources for recovery, who are exposed most. Controlling these floods is a daunting, and perhaps impossible, task – but much can be done to reduce the damage they cause by providing sufficient warning of the impending disaster for threatened populations to protect their property or move to safer areas. By their nature, floods are a regional issue. Most of the rivers that rise in the HKH region flow through more than one country. The countries of the region are drawn together through common river basins, and must come together to link upstream events with downstream consequences, and downstream policies with upstream consequences. To forecast floods with any degree of accuracy, timely and reliable hydrometeorological information is needed from the whole of each river basin, thus information must be exchanged across national borders, and all countries need a sufficient and compatible capacity in data collection, transmission, and flood forecasting.

The International Centre for Integrated Development (ICIMOD) has been concerned with issues of water management and disaster prevention in the HKH region for some twenty years, and has supported regional efforts to increase scientific and technical collaboration on water issues – from watershed management and micro-water harvesting to regional data sharing through the HKH-FRIEND project supported by UNESCO. At the global level, the World Meteorological Organization (WMO) has been promoting regional cooperation in hydrometeorological observation for a number of years through its World Hydrological Cycle Observation System (WHYCOS), which is increasingly being used as a framework for collaboration and development of resources.

In 2001, ICIMOD joined with WMO, with the support of ICIMOD's regional member countries, to initiate a project designed to address flood data and information exchange in the HKH region and its downstream plains areas, in particular the establishment of a regional flood information system. ICIMOD and WMO are ideally situated to help forge the active partnership between countries in the region that will be pivotal in the project's success, as all the HKH countries are members of both organisations.

* Foreword to the main volume

The project has been substantially supported by the U.S. Department of State Regional Environment Office for South Asia (USDS/REOSA) and the U.S. Agency for International Development Office of Foreign Disaster Assistance (USAID/OFDA), with further support from the Department of Hydrology and Meteorology of His Majesty's Government of Nepal and a small contribution from the Danish International Development Agency (DANIDA). The overarching goal of the project is to reduce the flood vulnerability of the HKH region and minimise the loss of lives and property, focusing in the first instance on the Ganges-Brahmaputra-Meghna and Indus river basins. The two major challenges are collection of the necessary high quality hydrometeorological data in all parts of the major river basins, including in remote areas with limited infrastructure, and facilitating a system for exchange of this data in real-time between the countries through which each river runs which builds on the bilateral arrangements already established in some cases.

The project has proceeded through a series of meetings: a 1st High Level Consultative Meeting held in May 2001, during which a framework was developed for a regional flood information system based on the proven concept of the WHYCOS, now called HKH-HYCOS; a Consultative Panel Meeting held in May 2002, at which a concept note was drafted and short, medium, and long term action plans outlined; and the 2nd High Level Consultative Meeting held in March 2003 which is the subject of this report. HKH-HYCOS has been formalised as a joint project of WMO and ICIMOD, as facilitating organisations between the regional member countries, through a Memorandum of Understanding between the two organisations.

This publication summarises the development of the project to date and provides a detailed report of the 2nd High Level Consultative Meeting held in March 2003, including summaries of the technical papers, and an outline of future plans. The full text of the technical papers is being published in a supplementary volume*. The meeting provided a valuable opportunity for high-level government representatives, directors of national hydrological and meteorological services, technical experts from the region and from the United States United States Geological Survey (USGS) and National Oceanic and Atmospheric Administration (NOAA), and representatives of international organisations, to share information and discuss organisational and technical approaches to flood forecasting and mitigation of flood-related damage. The participants discussed the draft project document and agreed on the action plan for the next stage. In the ongoing process, national consultations are now being held to identify the specific needs and priorities of each country for the establishment of the regional flood information system.

The people of the region have learned to seek in the Himalayas both spiritual solace and the means to improve the livelihoods of the people, both upstream and downstream. We hope that the optimism and cooperative spirit displayed at the meeting will imbue the commitment to follow through in each country and that we will be successful in establishing a regional flood information system, building on bilateral arrangements, that will provide the basis for ensuring physical security, saving lives, and reducing economic loss, while safeguarding the environment. ICIMOD is proud to be a part of this valuable initiative, and hopes that this publication will help to stimulate interest in and support for the project.

Dr. J. Gabriel Campbell
Director General
ICIMOD

* This volume

Note: The papers in this volume have undergone language editing, and in some cases been abbreviated, after submission by the authors.

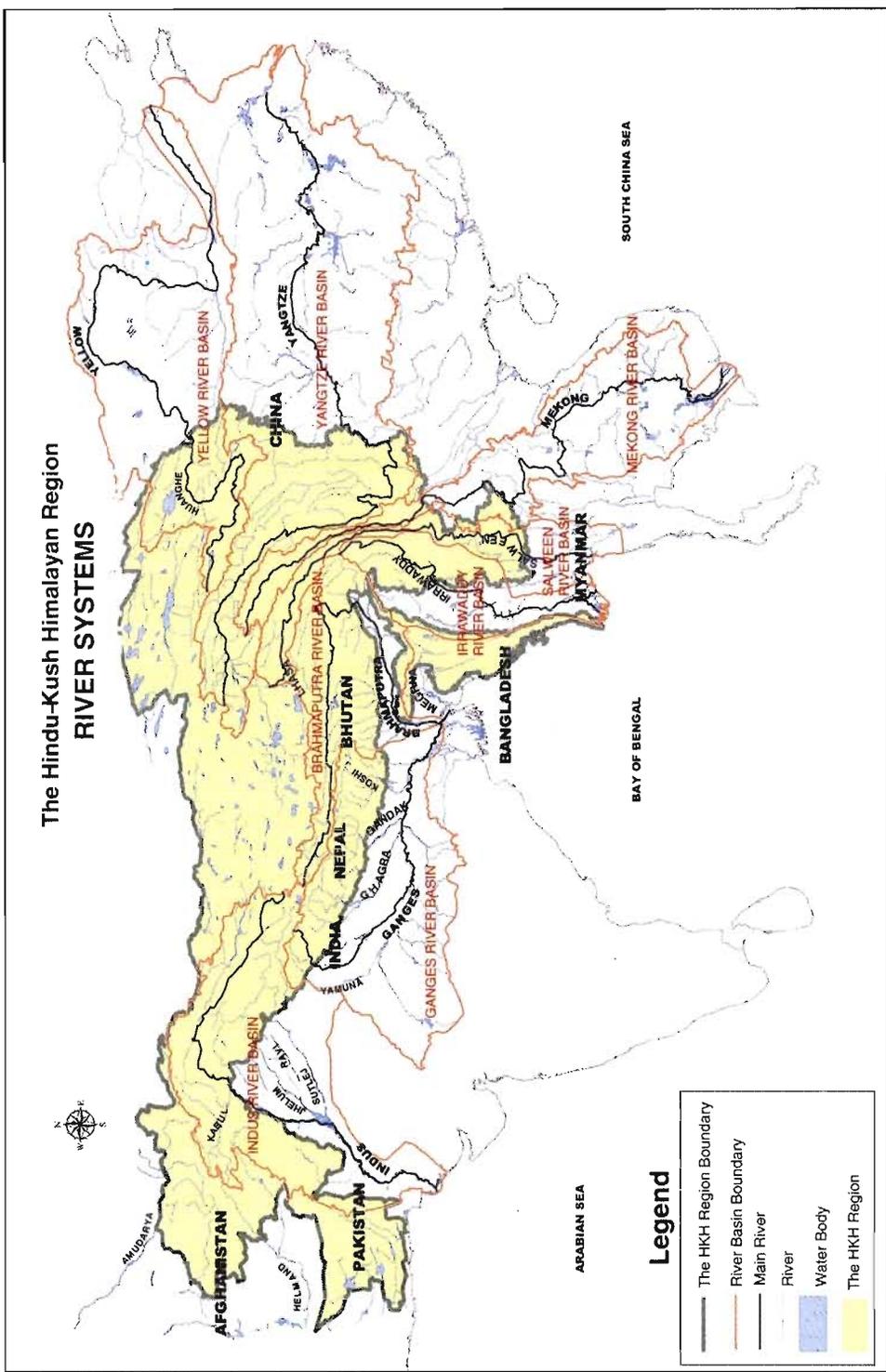
Acronyms and Abbreviations

ADM	A Distributed Model
APHMECRP	Andhra Pradesh Hazard Mitigation and Emergency Cyclone Recovery Project
ATOVS	Advanced Tirros Operational Vertical Sounder
BUP	Bangladesh Unnayan Parishad
BWDB	Bangladesh Water Development Board
CBO	community based organisation
CBS	Commission for Basic Systems (WMO)
CEGIS	Centre for Environmental and Geographic Information Services (Bangladesh)
CGMS	Coordination Group for Meteorological Satellites (WMO)
CMA	China Meteorological Administration
cumecs	unit of flow, cubic metres per second
cusecs	unit of flow cubic feet per second (0.28317 cumecs)
CWC	Central Water Commission (India)
DAB	digital audio broadcasting
DANIDA	Danish Agency for Development Assistance
DCP	data collection platform
DCS	data collection system
DCW	Digital Chart of the World (US National Imagery and Mapping Agency)
DDRGS	digital direct readout ground station
DEM	digital elevation model
DHI	Danish Hydraulic Institute
DHM	Department of Hydrology and Meteorology (Nepal)
DSP	digital signal processor
DVB	digital video broadcasting
DVC	Damodar Valley Corporation
ELOS	extended line-of-sight radio
ESRI	Environmental Systems Research Institute
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FAP	flood action plan
FCD	flood control and drainage
FDMA	frequency division multiple access

FF	flood forecasting
FFWC	Flood Forecasting and Warning Centre (Bangladesh)
FFWS	flood forecasting and warning system
FMO	Flood Meteorological Office (India)
ftp	file transfer protocol
GBM	Ganges-Brahmaputra-Meghna
GBMHTS	GBM Hydrometeorological Telecommunications System
GBMHTSIP	GBMHTS Implementation Plan
GDAS	global data assimilation system
GIS	geographical information system
GLOF	glacial lake outburst flood
GOES	Geostationary Operational Environmental Satellite (NOAA)
GTS	Global Telecommunication System (WMO)
GUI	graphical user interface
HF	high frequency
HIS	Hydrometeorological Information System (DHM)
http	hyper text transfer protocol
IMD	India Meteorological Department
IP	internet protocol
IPCC	Intergovernmental Panel on Climate Change
IWM	Institute of Water Modelling (Bangladesh)
LGO	local government organisation
mha	million hectares
MTC	mid-tropospheric cyclone
NCAR	National Center for Atmospheric Research (US)
NCEP	National Centers for Environmental Prediction (US)
NCMRWF	National Center for Medium Range Weather Forecasting (India)
NESDIS	National Environmental Satellite, Data, and Information Service (NOAA)
NEXRAD	next generation radar
nfs	network file system
NGO	non-government organisation
NOAA	National Oceanic and Atmospheric Administration (US)
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NRCS	Natural Resources Conservation Service (US Dept. of Agric.)
NWIS	National Water Information System (US)
NWS	National Weather Service (US)
OECD	Organisation for Economic Cooperation and Development
PRA	participatory rapid appraisal
PSU/NCAR	Pennsylvania State University / National Center for Atmospheric Research
PTT	platform terminal transmitters
QFP	quantitative precipitation forecasting

RDBMS	relational database management system
RTH	Regional Telecom Hub (New Delhi) (GTS)
SCAN	Soil Climate Analysis Network (NRCS)
SDE	spatial database engine (ESRI)
SHEF	Standard Hydrometeorological Exchange Format
SMS	short message service
SSB	single side band (radio)
SSI	spectral statistical interpolation
SSM/I	Special Sensor Microwave Imager
SST	sea surface temperature
TCP	transmission control protocol
TDMA	time division multiple access
TPWC	total precipitable water content
TRMM	Tropical Rainfall Measuring Mission
UNDP	United Nations Development Programme
USGS	US Geological Survey
UTC	Co-ordinated Universal Time
US	United States (of America)
VSAT	very small aperture terminal
WAPDA	Water and Power Development Authority (Pakistan)
WARPO	Water Resources Planning Organization (Bangladesh)
WL	water level
WMO	World Meteorological Organization

The Hindu-Kush Himalayan Region RIVER SYSTEMS



Legend

- The HKH Region Boundary
- River Basin Boundary
- Main River
- River
- Water Body
- The HKH Region

Source: USGS, DCW and ESRI Data & Map 2001.



PP 3/03 Supplementary Volume

Technical papers presented at the meeting on Establishment of a
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