Hydrology

117 *Alford, D.* **Hydrological aspects of the Himalayan region.** ICIMOD Occasional Paper No. 18, Kathmandu, International Centre for Integrated Mountain Development, 1992, 68p.

Loc: ICIMOD

This paper deals with the impact of human use of the natural environment on the hydrological regime of watersheds in the Himalayas. Analysis of existing data of the Koshi watershed of eastern Nepal, as an illustration of the interaction that has an impact on the water budget of a mountainous watershed, is also carried out.

118 *Bastola, S.N.* **Water resources development of the mighty Himalayan rivers (Indus, Ganga-Yamuna, Brahmaputra rivers).** Kathmandu, Bastola, S., 1994, 335p.

Loc. ICIMOD

A historical perspective of water resources is presented in this book. A detailed scenario of water resource development in Nepal and its sources are also presented.

119 *Binnie and Partners.* **Master plan for the water supply and sewerage of greater Kathmandu and Bhaktapur.** Kathmandu, WHO, UNDP (Special Fund Project), Nepal 0025, Vol. IIB, 1973.

120 *Bruijnzeel, L.A. ; Bremmer, C.N.* **Highland-Lowland interactions in the Ganges Brahmaputra river basin: A review of published literature,** ICIMOD Occasional Paper No. 11, Kathmandu, International Centre for Integrated Mountain Development, 1989, 136p.

Loc. ICIMOD

This is a review of published literature. The paper covers the river systems, geology and geomorphology, climate and vegetation, and land use of the study area. The paper also focusses on the role of forests and land use in the upland in relation to flooding, dry season flow, and sedimentation in the lowland .

121 *Caine, N.; Mool, P.K.* **Channel geometry and flow estimates for two small mountain streams in the middle hills, Nepal.** Mountain Research and Development, Vol. 1, 1981, 23-243p.

Loc: ICIMOD, WECS

The study is conducted in the middle hills of Kathmandu - Kakani area. By measuring channel conditions at 43 stations on Thulo Khola and Ghatte Khola, the peak discharge for the 1979 monsoon (a season of approximately normal precipitation) is estimated. It is also concluded that the variations in the channels and the flows they carry in this tropical, high-relief area conform to the patterns established by other studies.

122 *Chalise, S.R.* **Regional co-operation in hydrological research and training in the Hindu Kush-Himalayas.** In: Young, G.J. (ed.), Snow and Glacier Hydrology, Proceedings of the Kathmandu Symposium, (Nov. 1992), IAHS Publ. No. 218, United Kingdom, Oxfordshire, Institute of Hydrology, 1993, 37-47p.

Loc: DHM, CDOM, ICIMOD

The paper considers research needs in the Hindu Kush-Himalayan region and stresses the need for regional cooperation in hydrological research. Particular emphasis is placed on the development of a regional programme on Mountain Hydrology under the auspices of UNESCO and ICIMOD.

123 *Chyurlia, J.P.* **Water resources report, LRMP,** Ottawa, Kenting Earth Sciences Limited, LRMP, 1984, 271p.

Loc: ICIMOD

124 *Day, J.B.W.* **A Preliminary assessment of ground water resources of the Terai east of the Duney hills, Nawal Parasi district, Nepal.** London, Institute of Geol. Sciences. Department of Hydrology, 1974, 9p.

125 *Fukushima, Y.; Kawashima, K.; Suzuki, M.; Ohata, T.; Motoyama, H.; Kubota, H.;*

Bajracharya, O.R. **The Hydrological data of Langtang valley, Nepal Himalayas.** Bulletin of Glacier Research 5, 1987, 115-120p.

Loc: ICIMOD

Observations of the discharge from glacier-covered watersheds were carried out for a year starting in July 1985 at three sites in Langtang valley. The observation sites, the method, and the instruments used are discussed in this paper.

126 *Fushimi, H.; Ikegami, K.; Higuchi, K.; Shankar, K.* **Nepal case studies: Catastrophic floods.** Techniques for predictions of runoff from area, IAHS Publ. No. 149, United Kingdom, Oxfordshire, Institute of Hydrology, 1985, 125-130p.

127 *Galay, V.* **Erosion and sedimentation in the Nepal Himalaya - An assessment of river processes.** Kathmandu, Water and Energy Commission Secretariat, 1987, 214p.

Loc: ICIMOD

128 *Gole, C.V.; Chitale, S.V.* **Inland delta building of the Kosi river.** Journal of Hydraulics Division, Proceedings of the American Society of Civil Engineers, 92 (HY2), 1966, 111-126p.

129 *Gyawali, D.* **Water in Nepal: An interdisciplinary look at resource uncertainties, evolving problems, and future prospects.** East-West Environment and Policy Institute Occasional paper 8, Honolulu, East-West Centre, East-West Environment and Policy Institute, 1989, 146p.

Loc. ICIMOD

This monograph surveys the water situation in Nepal in terms of its supply and use. The monograph also points out the difficulties that arise when making decisions related to water resources.

130 *Higuchi, K.; Ageta, Y.; Kodama, H.* **Water discharge of Imja Khola in Khumbu Himal.** Seppyo, Vol. 38, Special Issue, 1976, 22-26p.

Loc: ICIMOD, DOM

Water discharge in perennial rivers is believed to contain large contributions of melt-water from the glaciers in the Himalayas. Studies of such river basins are important for a general assessment and rational use of water resources. The annual discharge of this drainage showed a tendency to increase in summer and decrease in winter. It was also found that the mean daily air temperature had a good correlation with the variation of daily discharge in summer but not in winter.

131 *HMG, Department of Hydrology and Meteorology.* **Methodologies for estimating hydrologic characteristics of ungauged locations in Nepal,** Vol 1 & II, Seq. No 4/4/250990/1/1, Kathmandu, DHM/WECS, Sept 1990.

132 *HMG, Department of Hydrology and Meteorology.* **Report of the regional workshop on hydrology of mountainous areas,** Kathmandu, HMG/ICIMOD/ UNESCO, (11-14, Dec. 1989), 1989, 17p.

Loc: ICIMOD

133 *HMG, Department of Hydrology and Meteorology.* **Compilation of surface records of Nepal through December 31, 1965.** Kathmandu, Department of Hydrology and Meteorology, 1967, 66p.

Loc: DHM, ICIMOD

This publication contains monthly and yearly discharge data for various rivers of Nepal.

134 *HMG, Department of Hydrology and Meteorology.* **Surface water records.** Supplement No. 1, 1966, Kathmandu, Department of Hydrology and Meteorology, 1967, 66p.

Loc: DHM, ICIMOD

This publication contains the mean monthly discharge and the maximum and minimum daily discharge data for the year 1966.

135 *HMG, Department of Hydrology and Meteorology.* **Surface water records.** Supplement No. 2, 1967, Kathmandu, Department of Hydrology and Meteorology, 1968, 71p.

Loc: DHM, ICIMOD

This publication contains the mean monthly discharge and the maximum and minimum daily discharge data for the year 1967.

136 *HMG, Department of Hydrology and Meteorology* **Surface water records.** Supplement No. 3, 1968, Kathmandu, Department of Hydrology and Meteorology, 1969, 63p.

Loc: DHM, ICIMOD

This publication contains the mean monthly discharge and the maximum and minimum daily discharge data for the year 1968.

137 *HMG, Department of Hydrology and Meteorology.* **Surface water records.** Supplement No. 4, 1969, Kathmandu, Department of Hydrology and Meteorology, 1972, 59p.

Loc: DHM, ICIMOD

This publication contains the mean monthly discharge and the maximum and minimum daily discharge data for the year 1969.

138 *HMG, Department of Hydrology and Meteorology.* **Surface water records.** Supplement No. 5, 1970, Kathmandu, Department of Hydrology and Meteorology, 1972, 51p.

Loc: DHM, ICIMOD

This publication contains the mean monthly discharge and the maximum and minimum daily discharge data for the year 1970.

139 *HMG, Department of Hydrology and Meteorology.* **Surface water records.** Supplement No. 6, 1971, Kathmandu, Department of Hydrology and Meteorology, 1973, 61p.

Loc: DHM, ICIMOD

This publication contains the mean monthly discharge and the maximum and minimum daily discharge data for the year 1971.

140 *HMG, Department of Hydrology and Meteorology.* **Surface water records.** Supplement No. 7, 1972, Kathmandu, Department of Hydrology and Meteorology, 1974, 59p.

Loc: DHM, ICIMOD

This publication contains the mean monthly discharge and the maximum and minimum daily discharge data for the year 1972.

141 *HMG, Department of Hydrology and Meteorology.* **Surface water records.** Supplement No. 8, 1973, Kathmandu, Department of Hydrology and Meteorology, 1979, 66p.

Loc: DHM, ICIMOD

This publication contains the mean monthly discharge and the maximum and minimum daily discharge data for the year 1973.

142 *HMG, Department of Hydrology and Meteorology.* **Surface water records.** Supplement No. 9, 1974, Kathmandu, Department of Hydrology and Meteorology, 1980. 51p

Loc: DHM, ICIMOD

This publication contains the mean monthly discharge and the maximum and minimum daily discharge data for the year 1974.

143 *HMG, Department of Hydrology and Meteorology.* **Surface water records.** Supplement No. 10, 1975, Kathmandu, Department of Hydrology and Meteorology, 1983, 57p.

Loc: DHM, ICIMOD

This publication contains the mean monthly discharge and the maximum and minimum daily discharge data for the year 1975.

144 *HMG, Department of Hydrology and Meteorology.* **Surface water records.** Supplement No. 11, 1976, Kathmandu, Department of Hydrology and Meteorology, 1984, 54p.

Loc: DHM, ICIMOD

This publication contains the mean monthly discharge and the maximum and minimum daily discharge data for the year 1976.

145 *HMG, Department of Irrigation.* **Ground water resources investigation in Lumbini Zone, Western Terai, Nepal.** Kathmandu, Dept. of Irigation and Kathmandu, U.S. Aid, 1976.

146 *HMG, Department of Tourism.* **Lakes of Nepal,** Kathmandu, Department of Tourism, 1973, 25p.

147 *ICIMOD.* **Report of the 1st consultative meeting of the regional working group on mountain hydrology.** In: Mountain Hydrology in the Hindu Kush-Himalayan Region, Kathmandu, UNESCO/IHP/ICIMOD, 24-26 Oct. 1990, 15p.

Loc: ICIMOD

This report presents the highlights of the regional workshop on hydrology of mountainous areas held in Kathmandu during December 1989. Various recommendations from the workshop are also presented.

148 *ICIMOD.* **Report of the 2nd consultative meeting of the regional working group on mountain hydrology.** In: Mountain Hydrology in the Hindu Kush-Himalayan Region, Kathmandu, UNESCO/HMG/ICIMOD, 16-18 Mar. 1992, 23p.

Loc: ICIMOD

This report presents the highlights of the second consultative meeting of the regional working group on mountain hydrology. Various recommendations of the regional working group are also given.

149 *Karmacharya, J.L.* **Hydrological studies of Nepal.** Kathmandu, Water and Energy Commission Secretariat, N. Report 4/2/150382/1/1, Seq. No. 103, 1982

150 *Kattelmann, R.* **Conflicts and co-operation over floods in the Himalaya - Ganges region.** Water International, Vol.15, No. 4, 1990, 189-194p.

Loc: ICIMOD

In this paper the author has discussed the degraded watershed conditions in the Himalayan foothills and resulting flood damage in the plains caused by the tributaries of the Ganges. Measures to control such floods in the plains are suggested.

151 *Kattelmann, R.* **Exporting Himalayan flood** In: International and transboundary water resources issues, Maryland, American Water Resources Association, 1990, 101-110p.

The author has raised the controversy about land use practices over high mountain areas and the resulting floods in the low lying plains. He highlights the importance of regional cooperation in exchanging hydrological data to better understand the hydrologic system of the Himalayan headwaters of the tributaries of the Ganges and the Brahmaputra.

152 *Kattelmann, R.* **Hydrologic regime of the Sapta Koshi basin, Nepal.** IAHS Volume on Large River Basin, IAHS-TUGG, Aug. 1991.

The conversion of forests into agricultural land and pastures in the Middle Hills of Nepal has been blamed for the increase in flood damage

downstream in India. In this paper, the author has examined the physical basis of the controversy. The author found out that the annual runoff has increased in the Sapta Koshi and so has the precipitation in the basin. There is no obvious trend in the rank of annual floods over the past two decades.

153 *Kattelmann, R.* **Hydrology and development of the Arun river, Nepal.** Lang, H.; Musy, A. (ed.), Hydrology in Mountainous Regions, IAHS Publ. No. 193, United Kingdom, Oxfordshire, Institute of Hydrology, 1990, 777-784p.

Loc: ICIMOD

The Arun river drains large areas in Tibet and Nepal. It is characterised by steep gradient and relatively high dry-season flow and little information is available on the hydrology of the Arun basin. In this paper, the author illustrates the unique features of Himalayan hydrology that must be considered when assessing the potential for water resource development in this region.

154 *Kattelmann, R.* **Mountain hazards and hydro-electric development in the Nepal Himalaya: Water for development.** In: Proceedings of the sixth IWRA world congress on water resources, Vol. I, 1988.

155 *Kattelmann, R.* **Uncertainty in assessing Himalayan water resources.** Mountain Research and Development, Vol. 7, No. 2, 1987, 279-286p.

Loc: ICIMOD

The importance of a variety of hydrological data for water resources' development is highlighted. A combined programme of data and report compilation, application of existing hydrologic techniques, and new research initiatives is suggested to reduce the uncertainty associated with hydrologic estimates in the Himalayas.

156 *Motoyama, H.; Yamada, T.* **Hydrological observations in Langtang valley, Nepal Himalayas, during 1987 monsoon - post monsoon season.** In: Glacial Studies in Langtang Valley - Report of the Glaciological Expedition of Nepal 1987-88, Japan, Sapporo, Glaciological Expedition of Nepal Project, 1989, 5-11p.

Loc: ICIMOD

Air temperature, precipitation, streamflow, and electric conductivity of stream water from glaciers were observed at two sites of Langtang valley of the Nepal Himalayas from August to October 1987. The fluctuations in glacier surface level and melting rate were also observed on the Yala glacier. In this paper various analyses of the collected data are undertaken to study the specific electric conductivity, equilibrium line, and the melting factor.

157 *Motoyama, H.; Yamada, T.* **Hydrological observations in Langtang valley, Nepal Himalayas, during 1987 post-monsoon season.** Bulletin of Glacier Research 7, 1989, 195-201p.

Loc: ICIMOD

Air temperature, precipitation, streamflow and electric conductivity of stream water from glaciers were observed at two sites of Langtang valley of the Nepal Himalayas from August to October 1987. The fluctuations of glacier surface level and melting rate were also observed on the Yala glacier. In this paper various analyses of the collected data are undertaken to study the specific electric conductivity, equilibrium line, and the melting factor.

158 *Nakawo, M.; Fujii, Y.; Shrestha, M.L.* **Water discharge of Rikha Samba Khola in the hidden valley, Mukut Himal.** Seppyo, Vol. 38, Special Issue, 1976, 27-30p.

Loc: ICIMOD, DOM

The study is based upon observations made of the water level of Rikha Samba Khola from July 16 to September 7, 1974. From this data, the river discharge is estimated from the stage discharge curve. The paper also deals with the suspended material present in the river from the river water sample taken during the observation period.

159 *Nepal Electricty Department.* **Gandaki river basin power study, basin study, hydrology and sedimentation.** Kathmandu, Nepal Electricity Department, Main Report, Vol. I, July 1974.

160 *Pradhan, P.P.* **River training works under the department of irrigation.** Report of the seminar on information exchange in the field of disaster prevention/ preparedness, Kathmandu, HMG/DPTC/ UNDP, 29 - 30 March, 1993, 160-162p.

161 *Shah, P.P.* **Water resources of Nepal.** Kathmandu, HMG, Dept. of Information, 1976, 78 p.

162 *Shankar, K.* **Hydrological network and hydrometric problems in Nepal.** Paper submitted to the regional workshop on hydrology of mountainous areas (unpublished), Kathmandu, HMG/UNESCO/ ICIMOD, December 1989, 17p.

Loc: ICIMOD

163 *Shankar, K.* **Mountain hydrology in reference to the Hindu Kush-Himalayan region.** Working paper prepared for the regional working group meeting on mountain hydrology, Kathmandu, UNESCO/ IHP/ICIMOD, 24-26 Oct. 1990, 29p.

This paper discusses the features and problems of the Hindu Kush-Himalayan region associated with mountain watershed hydrology.

164 *Shankar, K.* **Status and role of mountain hydrology in the Hindu Kush-Himalayan region.** In: MEM discussion paper No. 10, Kathmandu, ICIMOD, 1991, 34p.

Loc: ICIMOD

In this paper the hydrological processes of the Hindu Kush-Himalayas are discussed. According to the author, insufficient information for proper assessment of water resources, typical hydrological disasters, and degradation of the environment are some of the basic problems.

165 *Shankar, K.* **Water resources development with references to surface water hydrology in Nepal.** Kathmandu, HMG, Department of Hydrology and Meteorology, 1976, 15p.

166 *Sharma, C.K.* **A Glimpse of the ground water resources of Nepal.** Kathmandu, Dept. of Irrigation, Ground Water Project, 1970, 10p.

167 *Sharma, C.K.* **Ground water resources of Nepal.** Kathmandu, Mrs. Sangeeta Sharma, 1974, 162p.

Loc: ICIMOD

In this book the author has tried to analyse the utility and limitation of different possible sources of irrigation in Nepal. The book is especially useful for planners and engineers who are seeking to know the realities of the irrigation-related problems of Nepal.

168 *Sharma, C.K.* **The problem of sediment load in the development of water resources.** Mountain Research and Development, Vol. 7, No. 3, 1987, 316-318p.

Loc: ICIMOD

In this paper, the problems of heavy sediment loads and decreasing rates of flow are presented. The paper also deals with natural factors such as topography, geology, rainfall, glacial lake outbursts, and seismic events as well as human factors including deforestation and the construction of roads and canals which affect sedimentation. Techniques of controlling river flow are also suggested.

169 *Sharma, C.K.* **River Systems of Nepal.** Kathmandu, Mrs. Sangeeta Sharma, 1977, 214p.

Loc: ICIMOD

In this book, the author has tried to give some ideas about the river systems of Nepal. The book deals mainly with origin, development, and characteristics of the river systems of Nepal. The book also highlights the water resources and economic development of Nepal.

170 *Sharma, C.K.* **Water and energy resources of the Himalayan block (Nepal, Bhutan, Bangladesh, Pakistan and India).** Kathmandu, Mrs. Sangeeta Sharma, 1983, 477p.

Loc: ICIMOD

171 *Spreafico, M.; Grabs, W.E.* **Determination of discharge with fluorescence tracers in the Nepal Himalayas.** In: Young, G.J. (ed.), Snow and Glacier Hydrology, Proceedings of the Kathmandu Symposium (Nov. 1992), IAHS publ. No. 218, United Kingdom, Oxfordshire, Institute of Hydrology, 1993. 17-27p.

Loc: DHM, CDOM, ICIMOD

The determination of discharge from snow and glacier-fed rivers in the Nepal Himalayas is of prime importance for the estimation of snow and glacier-melt runoff needed for improved water-resources' management. Because the conventional current meter method is not suitable to measure discharge in many steep rivers in Nepal, an operational tracer measurement system, consisting of field and laboratory equipment, has been adapted to Nepalese conditions. An application-oriented training and education programme has been designed and implemented. The method used can be fully integrated into the operational hydrological surveys in developing countries.

172 *Suzuki, M.; Fukushima, Y.; Kawashima, K.; Ohata, T.; Motoyama, H.; Kubota, H.* **Stream water temperature observations in Langtang Khola, Nepal Himalayas.** Bulletin of Glacier Research 5, 1987, 25-28p.

Loc: ICIMOD

Stream water temperature was measured in Langtang Khola in order to describe the hydrological conditions in high altitude watersheds having glaciers. The authors found that the water temperature of the Langtang Khola has a gentle seasonal variation attributed to the large contribution of the water from glaciers throughout the year.

173 *Swarzenski, W.V.; Babcock, H.M.* **Ground water resources investigation program for the Western Terai, Nepal.** Kathmandu, Dept. of Irrigation, 1968, 57p.

174 *Upadhyay, S.P.; Sapkota, B.N.* **Water resources development in Nepal.** In: Ali, M.; Radosevich, G.E.; Khan, A.A. (ed.), Water resources policy for Asia. Rotterdam, A.A. Balkema, 1987, 91-104p.

Loc. ICIMOD

The paper highlights the development policy of water resources of the government of Nepal. The paper also points out the problems experienced in the use of water resources.

175 *Wager, L.R.* **The Arun river drainage pattern and the rise of the Himalaya.** Geographical Journal 89 (3), 239-250p.

176 *Zollinger, F.* **The Sapta Koshi: Unsolved problems of flood control in the Nepalese Terai.** Kathmandu, Deptartment of Soil Conservation and Watershed Management, 1979, 94p.

Loc: ICIMOD

177 *Adhikary, S.* **Estimation of snowmelt runoff during premonsoon months in Langtang Khola watershed.** M.Sc. Dissertation, Kathmandu, Tribhuvan University, 1994, 69p.

Loc: CDOM

In this thesis, the degree day method and the melt due to rainfall are utilised to estimate the snowmelt runoff in the Langtang watershed.

178 *Damen, M.* **Study on potential outburst flooding of Tsao Rolpa glacier lake, Rolwaling valley, East Nepal.** ITC Draft Report, 1992, 58p.

179 *Fukushima, Y.; Kawashima, K.; Suzuki, M.; Ohata, T.; Motoyama, H.; Kubota, H.; Yamada, T.; Bajracharya, O.R.* **Runoff characteristics in three glacier-covered watersheds of Langtang valley, Nepal Himalaya.** Bulletin of Glacier Research 5, 1987, 11-18p.

Loc: ICIMOD

Based upon the hydrological observations carried out in Langtang valley from July 1985 to June 1986, discharge analyses are carried out for three rivers in Langtang valley, namely, Langtang Khola, Liring Khola, and Khyimjung. In this paper the temporal variation of discharge is presented. The authors attribute this to rapid snowmelt and icemelt concluding that the variation in discharge from glacier-covered watersheds depends mainly on the variation of air temperature rather than the distribution of precipitation.

180 *Grabs, W.E.; Pokhrel, A.P.* **Establishment of measuring services for snow and glacier hydrology in Nepal - Conceptual and operational aspects.** In: Young G.J. (ed.) Snow and Glacier Hydrology, Proceedings of the Kathmandu Symposium (Nov. 1992), IAHS Publ. No. 218, United Kingdom, Oxfordshire, Institute of Hydrology, 1993, 3-16p.

Loc: DHM, CDOM, ICIMOD

The paper focusses on the conceptual design and implementation of the Snow and Glacier Hydrology Project of the Department of Hydrology and Meteorology, Nepal. Since 1987, six hydrometeorological stations have been established in altitudes ranging from 2,400 to 4,300m above sea level. The climatic differences of the Nepal Himalayas as recorded from the stations so far are briefly outlined in their regional context.

181 *HMG, Department of Hydrology and Meteorolgoy.* **Snow and glacier hydrology yearbook for 1987/1989.** Kathmandu, HMG, Department of Hydrology and Meteorology, Snow and Glacier Hydrology Unit, 1990, 74p.

182 *HMG, Department of Hydrology and Meteorology.* **Snow and glacier hydrology yearbook.** Supplement I & II, Kathmandu, HMG, Department of Hydrology and Meteorology, Snow and Glacier Hydrology Unit, 1991

183 *HMG, Department of Hydrology and Meteorology.* **Snow and glacier hydrology yearbook 1987-1992.** Kathmandu, HMG, Department of Hydrology and Meteorology, Snow and Glacier Hydrology Unit, 1993. 167p

184 *HMG, Water and Energy Commission Secretariat.* **Dudh Koshi river 1985 GLOF study survey report.** Report No 1/3/840587/1/1, Seq. No. 257, Kathmandu, HMG, Water and Energy Commission Secretariat, 1987

185 *HMG, Water and Energy Commission Secretariat.* **Preliminary study of glacier lake outburst floods in the Nepal Himalayas.** Phase I Interim Report, Kathmandu, HMG, Water and Energy Commission Secretariat, 1987, 250p.

Loc: ICIMOD

186 *Ives, J.D.* **Glacial lake outburst floods and risk engineering in the Himalaya.** ICIMOD Occasional Paper No. 5, Kathmandu, International Centre for Integrated Mountain Development, 1986, 42p.

Loc: ICIMOD

The paper reviews the Langmoche disaster in Khumbu Himal, which occurred on 4 August, 1985, destroying a small hydel project in the Everest region. It also emphasises the need for practical field research to understand these spectacular natural events in the Hindu Kush-Himalayas.

187 *Kattelmann, R.* **Role of snowmelt in generating stream flow during spring in East Nepal.** In: Young, G.J. (ed.), Snow and Glacier Hydrology, Proceedings of the Kathmandu Symposium (Nov. 1992), IAHS Publ. No. 218, United Kingdom, Oxfordshire, Institute of Hydrology, 1993, 103-112p.

Loc: DHM, CDOM, ICIMOD

Snowmelt runoff has been assumed to provide relief from the low flows of winter for one to two months before rainfall-runoff provides high flows in summer. This paper examines changes in recorded streamflow during the period from March through June in seven tributaries of the Koshi. It is inferred that streamflow increased by about 10 to 15 % from March to April and by 45 to 65% from April to May in most of the rivers studied.

188 *Meon, G.; Schwarz, W.* **Estimation of glacier lake outburst flood and its impact on a hydro project in Nepal.** In: Young, G.J. (ed.), Snow and Glacier Hydrology, Proceedings of the Kathmandu Symposium (Nov. 1992), IAHS Publ. No. 218, United Kingdom, Oxfordshire, Institute of Hydrology, 1993, 331-339p.

Loc: DHM, CDOM, ICIMOD

Glacier lake dams consisting of unconsolidated material are prone to failure and may cause disastrous surges of water heavily charged with debris. Consideration of potential glacier lake outburst floods is therefore essential. In this paper, as an example, a study of such a flood is carried out for the Arun river from the point of view of a hydropower project.

189 *Mool, P.K.* **Glacier lake outburst floods and some examples of Nepal.** In: Report of the Seminar on Information Exchange in the Field of Disaster Prevention/Preperedness - Kathmandu, HMG/DPTC/UNDP, 29 - 30 March 1993, 31-53p.

190 *Motoyama, H.; Ohata, T.; Yamada, T.* **Winter runoff in the glacialized drainage basin in Langtang valley, Nepal Himalayas.** Bulletin of Glacier Research 5, 1987, 29-23p.

Loc: ICIMOD

Hydrological and meteorological observations were carried out in the glacial watershed of Langtang valley from July 1985 to July 1986. In this paper the authors focus their attention on the low flow of water that occurs in winter without inflow of rain water and melt water from snow and glacier surfaces.

191 *Murakami, S.; Ozawa, H.; Yamada, T.* **Permeability coefficient of water in snow and firn at the accumulation area of Yala glacier, Nepal Himalaya.** In: Glacial studies in Langtang valley, report of the Glaciological Expedition of Nepal Himalayas 1987-88 Japan, Sapporo, Glaciological Expedition of Nepal Project, 1989, 13-18p.

Loc: ICIMOD

The permeability of water in snow and firn was measured *in situ* by means of the ordinary falling head method using fresh cone samples obtained at the accumulation area in Yala glacier, Nepal Himalayas, in the post-monsoon season of 1987. In this paper the value of the permeability coefficient is discussed in relation to the grain size of the sample.

192 *Sharma, K.P.* **Role of meltwater in major river systems of Nepal.** In: Young, G.J. (ed.), Snow & Glacier Hydrology,

Proceedings of the Kahtmandu Symposium (Nov. 1992), IAHS Publ. No. 218, United Kingdom, Oxfordshire, Institute of Hydrology, 1993, 113-122p.

Loc: DHM, CDOM, ICIMOD

Karnali, Narayani, and Koshi are the three major river systems in Nepal. More than 50% of the drainage area lies above 3000m above sea level. Analyses of these river systems are made during the low flow period. It was observed that the lowest flow period is during February and March. The snowfed rivers showed distinct rise in the pre-monsoon period with the contribution exceeding 30% in May.

193 *Thapa, K.B.* **Estimation of snowmelt runoff in Himalayan catchments incorporating remote sensing data.** In: Young, G.J. (ed.), Snow and Glacier Hydrology, Proceedings of the Kathmandu Symposium, Nov. 1992, IAHS Publ. No. 218, United Kingdom, Oxfordshire, Institute of Hydrology, 1993, 69-74p.

Loc: DHM, CDOM, ICIMOD

This paper presents the results of hydrological investigations based on photo interpretation of the Himalayan catchments in and around Nepal along with the functional relationships of pre-monsoonal snowmelt-runoff with temperature and snow-covered area. Available landsat images, temperature and streamflow data have been analysed from 1975 to 1989. The study demonstrates the operational value of satellite data for predicting spring runoff of remote Himalayan catchments.

194 *Vuichard, D.; Zimmermann, M.* **The 1985 catastrophic drainage of a moraindammed lake, Khumbu Himal, Nepal: Causes and consequences.** Mountain Research and Development , Vol. 7, No. 2, 1987, 91-110p.

Loc: ICIMOD

The paper focusses on hazard assessment of the moraine-dammed glacial lake burst in the Khumbu area of eastern Nepal on 4 August, 1985. The paper also emphasises the need for monitoring such events.

195 *Vuichard, D.; Zimmermann, M.* **The Langmoche flash-flood, Khumbu Himal, Nepal.** Mountain Research and Development, Vol 6, No. 1, 1986, 90-93p.

Loc: ICIMOD

This paper is a preliminary report of a reconnaissance study of the Khumbu Himal area flash-flood on 4 August, 1985, which was contributed by the United Nations University, Mountain Hazards Mapping Project. An attempt is made to estimate the damage to land, property, and vegetation. Geomorphological damage due to flash-floods is also discussed in brief.

196 *Wushiki, H.* **Deuterium content of stream waters of glacier origin in the Himalayas.** Seppyo, Vol. 39, Special Issue, 1977, 40-42p.

Loc: ICIMOD, DOM

In this paper, measurement of the deuterium contents of samples taken from August 1974 to July 1975 in the Imja Khola has been provided. The monthly deuterium content of this river has been presented along with the deuterium content in six other rivers in Sunkoshi. It has been concluded that each river has a characteristic deuterium content and this varies drastically from river to river.

197 *Yamada, T.* **Preliminary report on glacier lake outburst flood in the Nepal Himalayas.** Report No. 4/1/291191/1/1, Seq. No. 387, Kathmandu, HMG, Water and Energy Commission Secretariat, 1991, 30p and Photographs.

198 *Yamada, T.* **Report for the first research expedition to Imja glacier lake.** Report No. 3/4/120892/1/1, Seq. No. 412, Kathmandu, HMG, Water and Energy Commission Secretriat, 1992, 14p.

199 *Yamada, T.; Motoyama, H.* **Contribution of glacier melt-water to runoff in glacialized watersheds in the**

Langtang valley, Nepal Himalayas. Bulletin of Glacier Research 6, 1988, 65-74p.

Loc: ICIMOD

The study is based upon hydrological and meteorological data observed over a year at Langtang Khola and Lirung Khola in the watershed of Langtang valley area. To estimate the contribution of snowmelt water to runoff a simple method is used. Precipitation, temperature, and distribution of watersheds from the topographical map of Langtang Himal are used as input for the study.

200 *Yamada, T.; Motoyama, H.; Thapa, K.B.* **Role of glacier melt-water in discharge from the glacial watersheds of Langtang valley.** Data Centre for Glacial Research, 1984, 61-71p.

201 *Yamada, T.; Sharma, C.K.* **Glacier lakes and outburst floods in the Nepal Himalaya.** In: Young, G.J. (ed.), Snow and Glacier Hydrology, Proceedings of the Kathmandu Symposium (Nov.1992), IAHS Publ. No. 218, United Kingdom, Oxfordshire, Institute of Hydrology, 1993, 319-330p.

Loc: DHM, CDOM, ICIMOD

Severe floods caused by glacier outbursts have been frequent in the Nepal Himalayas. Potentially dangerous glaciers were identified from flight observations which were undertaken during the pre-monsoon season and the post-monsoon season of 1991. Hazard records of glacier lake outburst floods are presented. Dangerous glacier lakes in the Nepal Himalayas as observed from the aircraft are also discussed. Finally, the potential of the Imja glacier lake, a typical example of the most dangerous glacier lakes, is assessed.