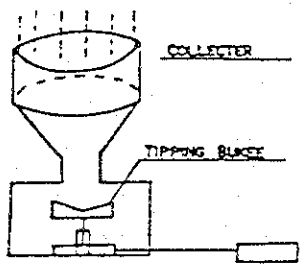
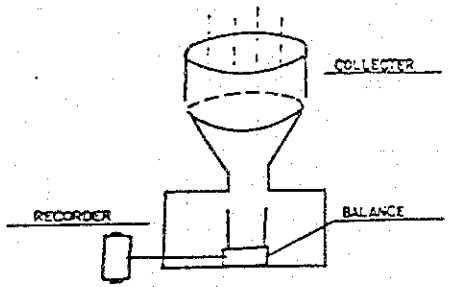
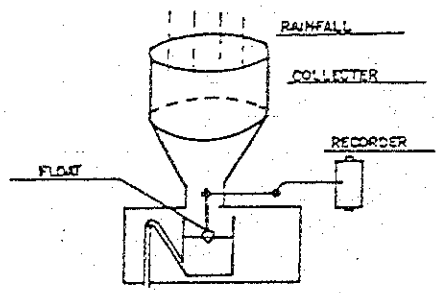
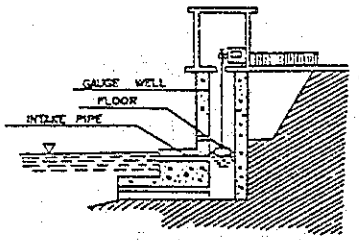
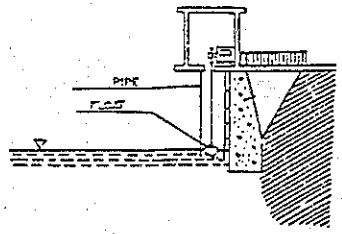
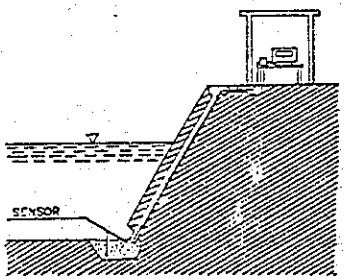
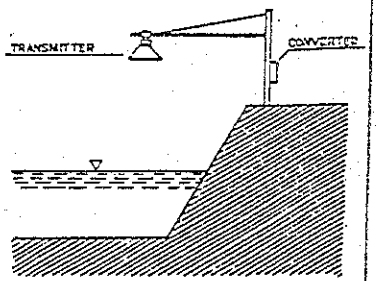
Table 6.1 COMPARISON OF RECORDING RAINFALL GAUGE

Item	Tipping buket-type	Weighing-type	Float with siphons-type
Figures			
Mechanism	This raingage operates by means of a pair of bukets. The flip-flop motion of the tipping buket transmitted to the recording device.	This raingage continuously records the weight of the receiving can plus the accumulated rainfall by means of a spring or balance weight	This raingage has a chamber contraining a float that rises vertically as the water level in the chambers rise Advice for siphoning the water out of the gage is used.
Arruracy	0.1mm (according to volume of tipping buket) |1	0.1~0.3mm (according to capacity of balance) |2	0.1mm (according to chamber size) |1
Inaccuracy	- >100 mm/hr. - Continuous drizzle, fine rain |2	- Variable unit weight of rain |2 - evaporation if necessary, thin film of oil to be used.	- Frictional effects in float guide |2 - evaporation
Easyness of operation	Easy |1	Easy |1	Siphon is difficult operation |2
Power supply	Battery |3	Spring-wound |1	Spring-wound |1
Lightening	Necessary to be considered |3	not necessary to be considered |1	not necessary to be considered |1
Maintenance	Adjustment of tipping bucket overhaul is necessary (5 years) |3	adjustment of balance |1	Siphon is fragile |3
Snow-fall measurement	impossible without heating device if rainfall catch freeze, buket may be unbalance |3	Water equivalent snow can be measured |1	impossible without heating device. if rainfall catch freeze float may be damaged. |3
Recording Period	Long-term available |1	Short-term (depend on container) |2	Long Term available |1
Data loggar	Analog/Desital |1	Analog |3	Analog |3
Price	expensive |3	Cheapter |1	Cheap |2
Expcience in Nepal	Yes	Yes	no operation |2
Evaluation	2 (only combination with data loggar)	1	3

1 | 2 | 3

Good —> bad

Table 6.2 COMPARISON OF RECORDING WATER LEVEL GAUGE

Type of water level gauge		Float-type (well)	Float-type(pipe)	Pressure-type	Ultrasonic-type
Outline of installation					
Outline of mechanism		a float inside the gauge well is used, change of a float level transfer the recorder	a float inside the gauge well is used, change of a float level transfer the recorder	Water pressure is detected by a scimiconductor/cristal quartz sensor and transfer effective signal	Ultrasonic pulse is shooted from the transmitter above water, water level is detected from reflection time
	Scouring	Supposing mulfunction of intake pipe, a gauge house have to be reconstruction 4	Intake pipe can be adjusted, if necessary 3	Sensor can easily be moved to the other site, if necessary 2	no problem 1
	Sediment	Blockade of intake-piepe and well clearance of well is necessary 4	blockade of intake pipe, clearance of pipe is necessary 3	Clearance around sensor, if necessary 2	no problem 1
	Flood	Sometimes enormous flood makes gauge well destroyed. 4	Sometimes enormous flood makes gauge pipe destroyed 3	Big flood can only wash out sensor. 2	Floating materials make errors of water level. 1
	Flow with boulder/rock	2	Protection for pipe is necessary 3	Protection for sensor is necessary 4	no problem 1
	Price	Cheap price 2	Cheape price 1	Expensive price 3	More expensive price 4
	Accuracy	Errors by flactuation 1	Errors by flactuation 2	Errors by deposition inside pipe 3	Errors by wind and floating materials 4
	Power Supply	no need (Spring-wound) 1	no need (Spring-wound) 1	Battery 2	Ac100/DC12 V 4
	Life time	Long life 1	Long Life 1	3	4
	Maintenance	Easy due to simple mechanism 1	Easy due to simple mechanism 1	Sensor is difficult to maintain/repair 3	Specialist for maintenance is necessary 4
	Labour/Material	Expensive cost of material and labour for construction work 4	Cheaper cost than well-type construction 3	Cheapter cost for Labour and Material 1	Chea Cost for Labour and Material 2
	Transportation	Difficult transportation in remote area due to large quantities of materials 4	Easyer transportation than well-type one 3	Easyer transportation due to small quantities of material 1	Easy transportation 2
	Period	Long period for construction on of well 4	Shorter period than well-type construction 3	Shorter period 1	Short Period 2
Experience in Nepal:		Most of water level recorder in Nepal are float-type (well), but sediment and scouring trobules occur frequently, sometimes big flood destroyed gauge well.		First pressure-type gauge was installed in 1990, at present 4 pressure-type gauges are operational and monitoring.	No experience in Nepal.

1	2	3	4

expected advantage —> expected disadvantage

Table 6.3 SUMMARY OF INSTRUMENTS OF MODEL OBSERVATION SYSTEM

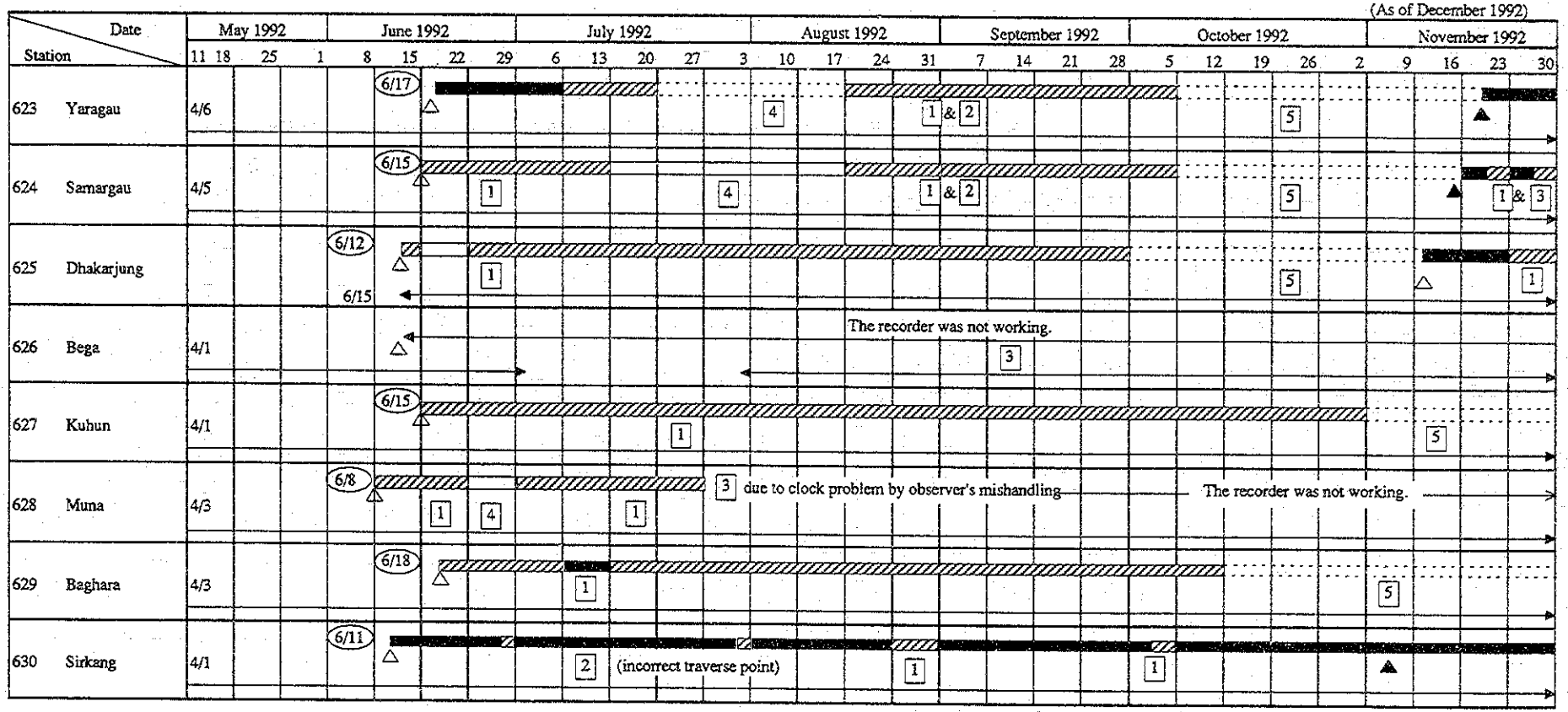
1) Water Level Gauging Station

Station / River name	Water level observation				Discharge measurement		
	Type of water level gauge	Recorder	Recording chart	Power source	Cable way	Current meter	Sounding weight
1. Tatopani / Kali Gandaki	Pressure-type	Pen-type	1 week	Battery	Double-drum winch	Propeller-type	100 kg
2. Kalleri / Kali Gandaki	Pressure-type	Data logger	Selectable	Battery	Double-drum wind	Propeller-type	100 kg
3. Setibeni / Kali Gandaki	Pressure-type	Pen-type	1 week	Battery	Single drum (existing)	Price-type	100 lbp
4. Chyuntaha / Jamuni River	Float-type	Pen-type	1 week	Battery	Double-drum winch	Propeller-type Pigmy-type	50 kg —

2) Rainfall Gauging Station

Station / Basin name	Type of raingauge	Recorder	Recording chart	Power source	Snowfall measurement	Remarks
Kali Gandaki Basin						
1. Yaragau	Weighing-type	Pen-type	1 week	Spring	Possible	
2. Samargau	Weighing-type	Pen-type	1 week	Spring	Possible	
3. Dhagarjong	Weighing-type	Pen-type	1 week	Spring	Possible	
4. Beghara	Weighing-type	Pen-type	1 week	Spring	Possible	
5. Muna	Weighing-type	Pen-type	1 week	Spring	Possible	
6. Khuldi Dovan	Weighing-type	Pen-type	1 week	Spring	Possible	
7. Bega	Weighing-type	Pen-type	1 week	Spring	Possible	
8. Kuhun	Weighing-type	Pen-type	1 week	Spring	Possible	
9. Sallyan	Weighing-type	Pen-type	1 week	Spring	Possible	
10. Pamdur	Tipping bucket-type	Data logger	Selectable	Battery	Impossible	
11. Sirkon	Weighing-type	Pen-type	1 week	Spring	Possible	
12. Tisedi	Weighing-type	Pen-type	1 week	Spring	Possible	
Jamuni River Basin						
13. Chyuntaha	Weighing-type	Pen-type	1 week	Spring	Possible	
14. Kolbi	Weighing-type	Pen-type	1 week	Spring	Possible	

(Revised in June 1993)
(As of December 1992)

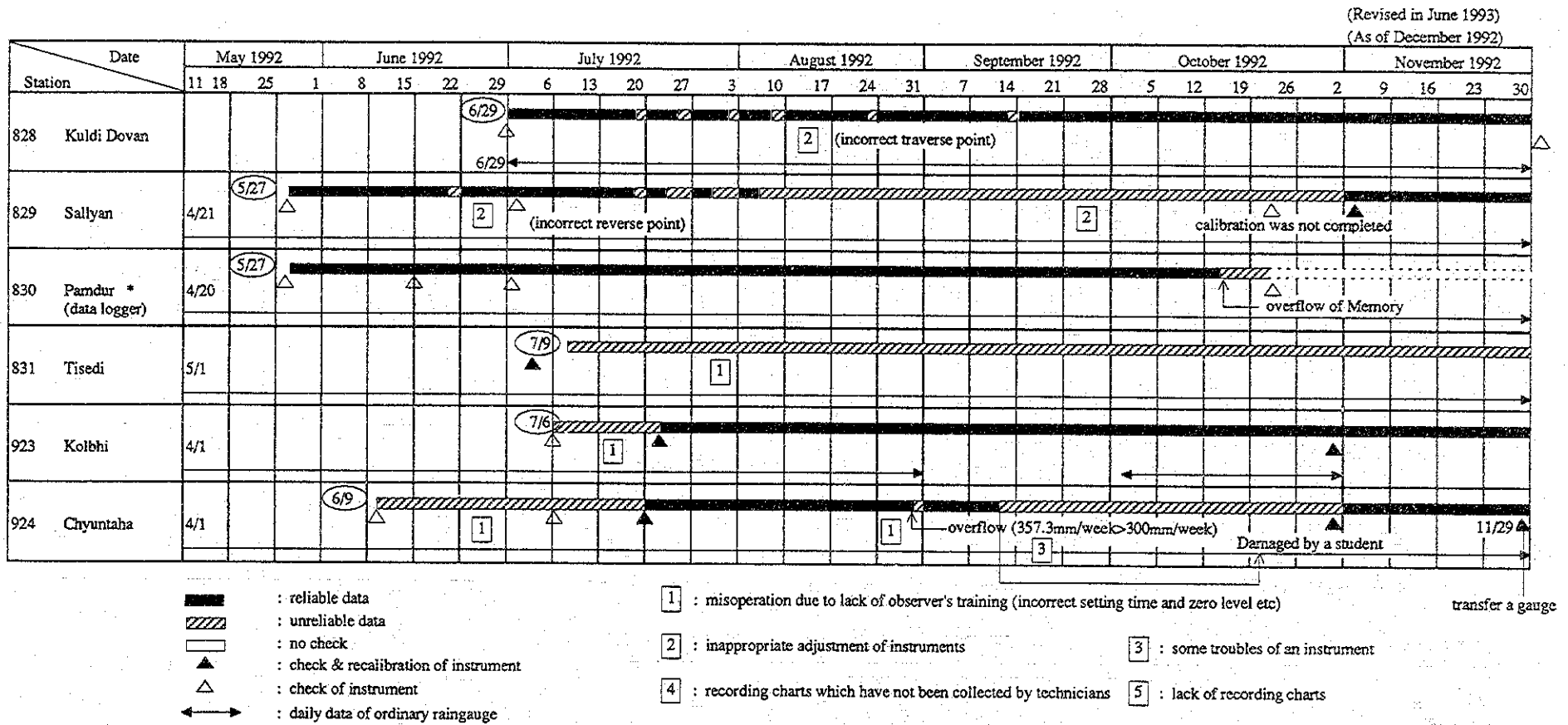


: reliable data
: unreliable data
: no check
: check & recalibration of instrument
: check of instrument
: daily data of ordinary raingauge

All recording gauges are weighing type ones.

[1] : misoperation due to lack of observer's training (incorrect setting time and zero level etc)
[2] : inappropriate adjustment of instruments
[3] : some troubles of an instrument
[4] : recording charts which have not been collected by technicians
[5] : lack of recording charts

Table 6.4 STATUS OF RAINGAUGE RECORD (1/4)



* All recording gauges are weighing type ones except No. 0830 at Pamdur, which is tipping bucket-type with data logger system.

Table 6.4 STATUS OF RAINGAUGE RECORD (2/4)

(Revised in June 1993)
(As of December 1992)

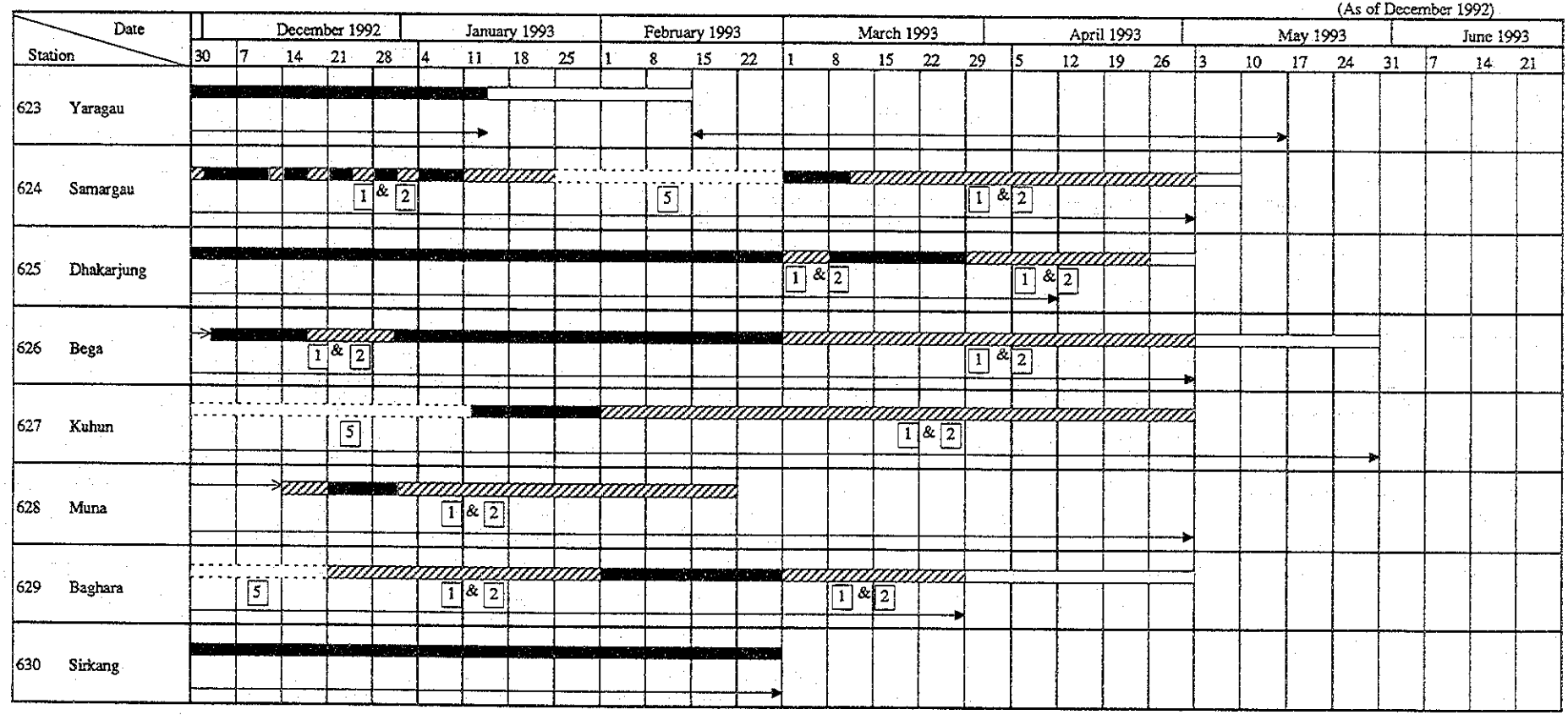
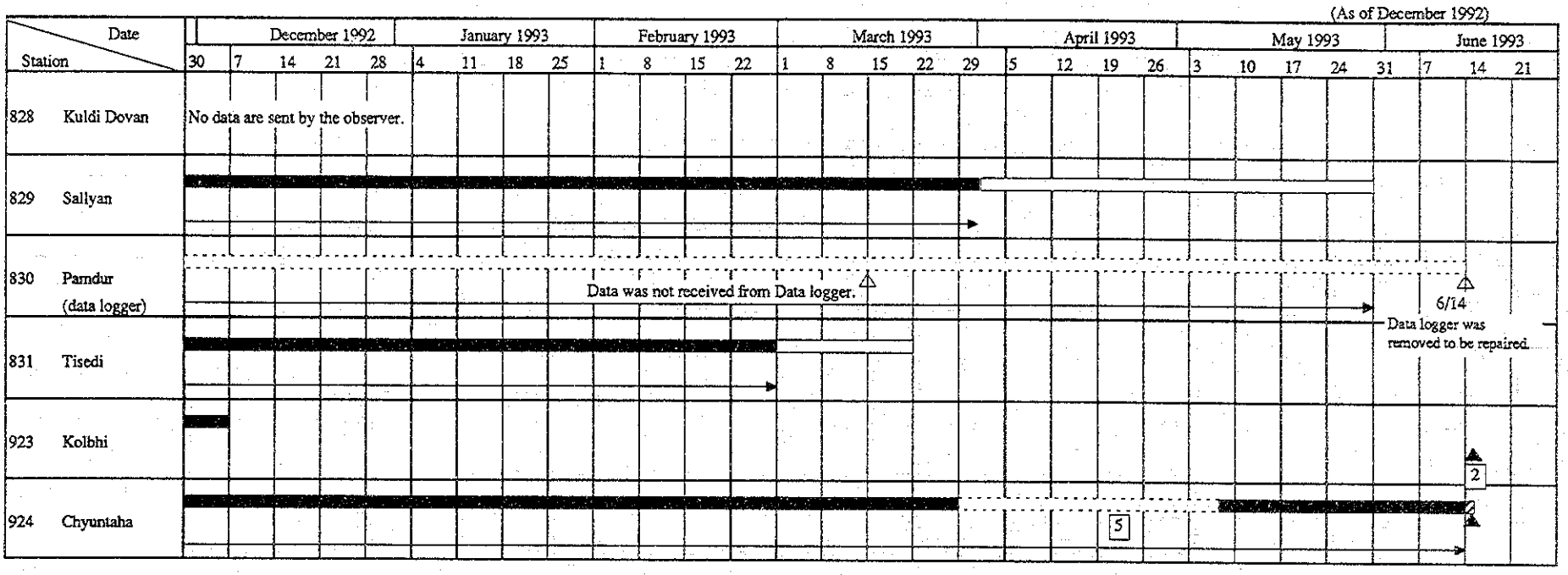


Table 6.4 STATUS OF RAINGAUGE RECORD (3/4)

(Revised in June 1993)
(As of December 1992)



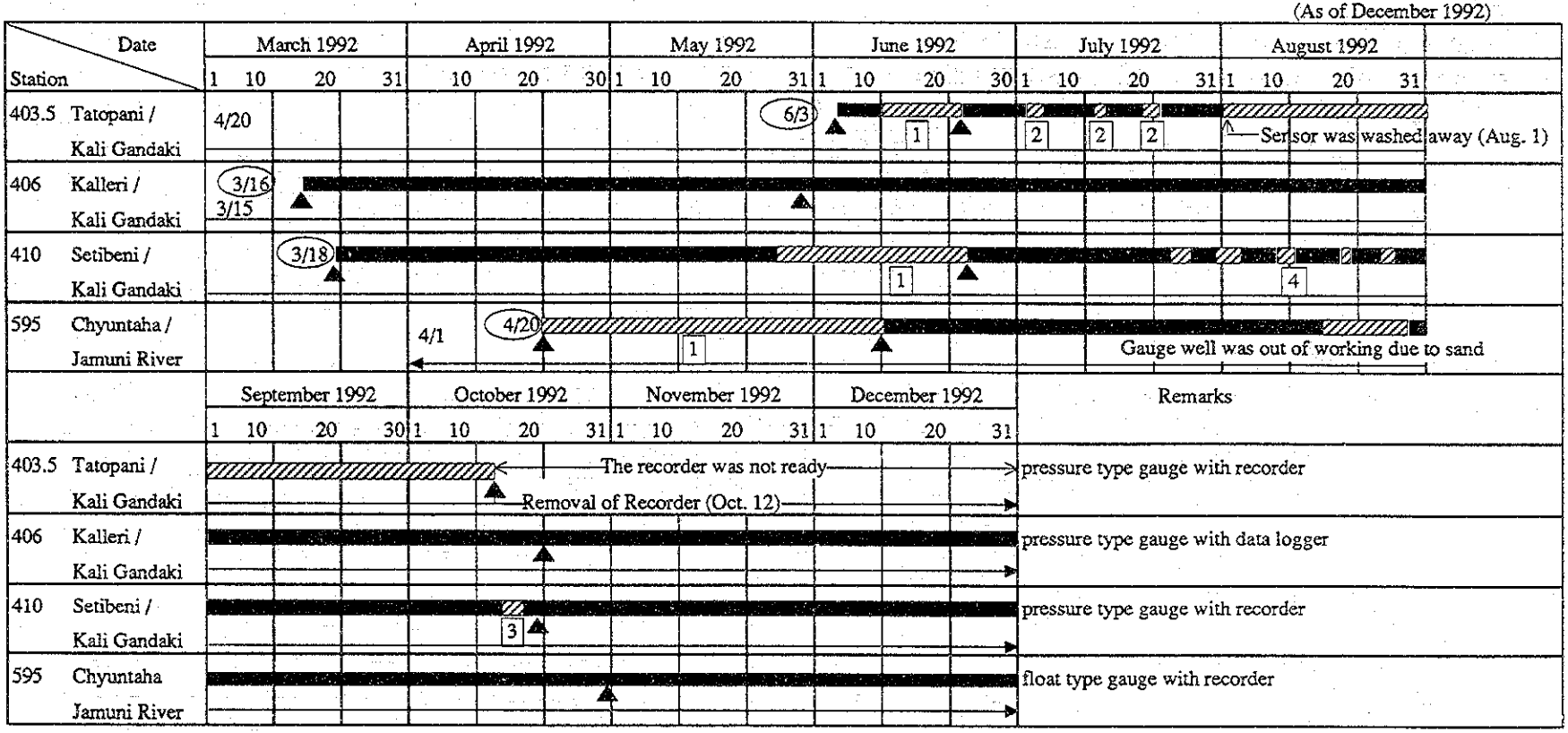
: reliable data
: unreliable data
: no check
: check & recalibration of instrument
: check of instrument
: daily data of ordinary raingauge

All recording gauges are weighing type

[1] : misoperation due to lack of observer's training (incorrect setting time and zero level etc)
[2] : inappropriate adjustment of instruments
[3] : some troubles of an instrument
[4] : recording charts which have not been collected by technicians
[5] : lack of recording charts

Table 6.4 STATUS OF RAINGAUGE RECORD (4/4)

(Revised in June 1993)
(As of December 1992)



Note :
- ■ : reliable data
- ▨ : unreliable data
- □ : not yet checked
- ▲ : inspection of station (DHM & JICA)
- ◄——► : staff gauge reading

- [1] : misoperation due to lack of observer's training (incorrect setting time and water level, misadjustment etc)
- [2] : stop clock (for spring watch)
- [3] : Low battery (for pressure sensor)
- [4] : High water level was cut due to some machine trouble
- [5] : Lack of recording chart

Table 6.5 STATUS OF WATER LEVEL GAUGE RECORD (1/2)

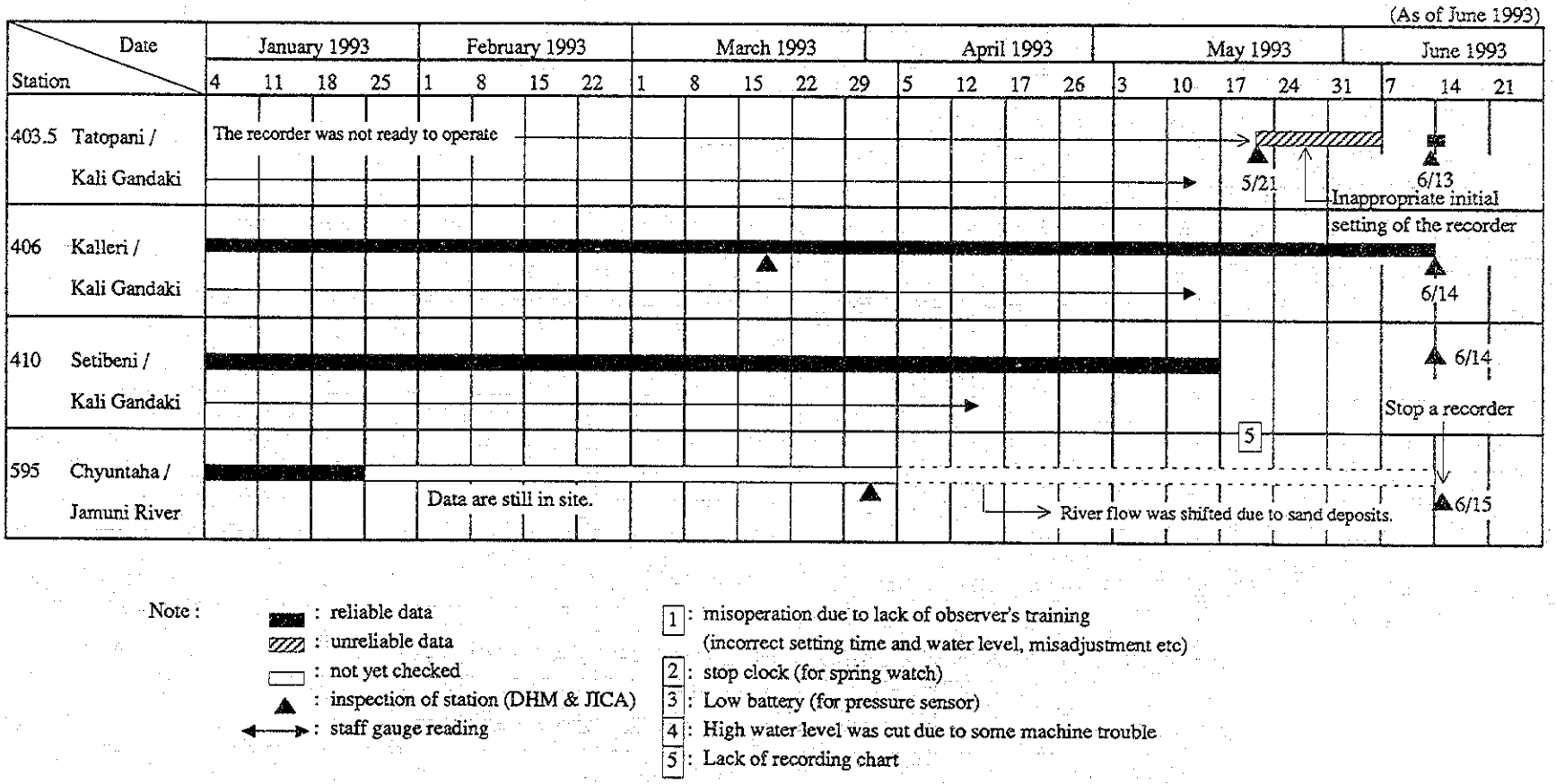


Table 6.5 STATUS OF WATER LEVEL GAUGE RECORD (2/2)

Table 6.6 FIELD MEASUREMENTS AT HYDROMETRIC STATION

Station \ date / Field Study	April			May			June			July			August			September			October			November		
	10	20	30	1	10	20	31	1	10	20	30	1	10	20	31	1	10	20	30	1	10	20	31	1	10	20
				5/16	Third Field Study							7/12						9/22		Forth Field Study				11/18		
Tatopani / Kali Gandaki								▲ 6/21												● 10/14						
Kalleri / Kali Gandaki										▲▲ 6/29,30			△△ 8/11,12							▲ 10/20					
410 Setibeni / Kali Gandaki								▲▲ 6/25,26,27 ●● 6/25,26 ■ 6/27												▲ 10/17 ●● 10/15,18 ■ 10/17						
Chuntaha / Jamuni River	△△△ 4/17,18,19,20,21							▲ 6/9	△ 6/21			△ 7/5											▲ 10/31			

NOTE :

- ▲ Discharge Measurement by current meter (DHM & JICA)
- △ Discharge Measurement by current meter (DHM)
- ● Float Measurement (DHM & JICA)
- ■ Suspended sediment sampling (DHM & JICA)

Table 6.7 PROPOSAL OF LONG TERM PROGRAMME BASED ON MODEL SYSTEM OBSERVATION (1/2)

		Model System		Proposal for Long Term Programme
		Items to be monitored	Problems / Findings	
(A) Observation	(1) Precipitation Observation	Selection of Raingauge type		
		(a) Weighing-type recording raingauge with weekly drum chart	- Some difficulty with adjustment due to friction of mechanical parts and sensitivity - Influence by evaporation and wind vibration	- Weighing-type raingauge to be selected in snowfall area.
		(b) Tipping bucket-type recording raingauge with data logger	- Check of stored data is impossible in site - Easy data processing	- Tipping-bucket type raingauge to be selected - Data logger system with monitoring function to be included
		Instalation, Operatino and Maintenance		
		(a) Weighing-type recording raingauge with weekly drum chart	- Unreliable records due to inadequate traini for observers and unqualified observers. - Unreliable records due to insufficient adjustment and check of instrument	- Adequate training of operation for observers is necessary - Adequate training of calibration for technicians is necessary - Proper and regular calibration should be carried out (yearly) - Immediate Repair and Adjustment should be conducted
		(b) Tipping buckit-type recording raingauge with data logger	- Loss of stored data by misoperation	- Adequate training of data logger operation for technicians is necessary
	(2) Water level Observation	Selection of gauge type		
		(a) Pressure-type water level recorder with weekly drum chart	- One of pressure sensor was washed away due to attack of flowing boulders	- Design of structure to be reviewed - Appropriate site selection
		with data logger	- Easy data processing - Check of stored data is impossible in site	- Data logge system with monitoring function to be included
		(b) Float-type water level recorder with weekly drum chart (adjustable steel pipe well)	- Sand deposit around gauge well made gauge well out of working	- Daily inspecton and maintenance by observers is necessary.
		Installation, Operation and Maintenance		
		(a) Pressure-type water level recorder with weekly drum chart	- Unreliable records due to inadequate training for observers	- Adequate training of operation for observers is necessary - Immeadiate Repair should be conducted
		with data logger	- Loss of stored data by misoperation	- Adequate training of data logger operation for technicians is necessary
		(b) Float-type water level recorder with weekly drum	- Unreliable records due to inadequate training for observers	- Adequate training of operation for observers is necessary

Table 6.7 PROPOSAL OF LONG TERM PROGRAMME BASED ON MODEL SYSTEM OBSERVATION (2/2)

		Model System		Proposal for Long Term Programme
		Items to be monitored	Problems / Findings	
	(3) Discharge Measurement	Selection of cable way and current meter		
		(a) Bank operating double drum winch cable way	- Safety and easy handling with heavy weight during flood	- Bank operating cable way to be included
		(b) Propelle-type current meter	- At steep and rocky river in high mountain area propeller is subjected to be damaged due to attack of boulders (protector to be provided)	- Study on new technological current meter (electromagnetic meter etc) - Study on alternate discharge measurement in case difficult condition using current meter (tracer method by measuring structure such as weir, flume)
		(c) Price current meter		
		Operation and Maintenance of Equipment		
		(a) Field observation training		- Field training to be included
		(b) Preparation of operation/ Maintenance Manual for both observers and technicians		- Operation/Maintenance Manual to be revised
		Introduction of Flood		
		- Float measurement		- Float method and slope area method is effective
	(4) Sediment Sampling	Improvement of Sampling Method		
		(a) Suspended sediment with discharge measurement		- Following items should be included in sampling by taking account of river characteristic * Discharge measurement at the same time * Selection of point/depth integrated sampling * Appropriate sampling section * Frequent flood sampling
		(b) Range sampling by using depth integrated sampler		
		(c) Three (3) sampling section		
(B) Establishment Inspection	(1) Establishment and Maintenance of station	Study on Model System Inspection Manual		- Inspection/Maintenance Manual to be revised
		(a) Preparation of Model system inspection Manual		
(C) Data quality Improvement and Training	(1) Staff training	On the job training of field activities		
		(a) Field observation training such as discharge measurement, float method,sediment sampling and operation of measuring instruments		- Regular field observation and Basic Meteorology and Hydrology training for technicians is necessary
		(b) Calibration and Minor Repair works of instrument		- Training on Adjustment and Minor repair of equipment for technicians is necessary
		(c) Preparation of Observation Manual		- Observation Manual to be revised

Table 6.8 (1) FIELD ACTIVITIES OF MODEL OBSERVATION

During Second Field Study (Feb. 8 - Mar. 25, 1992)

Data	Place	Activities	Attendance of DHM
Feb. 25 - 26, 1992	Kathmandu	- Temporary assembling of double-drum winch cable way at factory	
Mar. 3 - 6, 1992	Kalleri	- Installation of double-drum winch cable way - Check and test operation	Mr. S. B. Prajapati
Mar. 10 - 11, 1992	Setibeni	- Preparatory work for installation of pressure type water level gauge	ditto
Mar. 12 - 15, 1992	Kalleri	- Check and test operation of cable way - Installation of pressure type water level gauge with data logger	ditto
Mar. 16, 1992	Pamdur	- Installation of tipping bucket-type raingauge with data logger	ditto
Mar. 17, 1992	Setibeni	- Installation of pressure type water level gauge	Mr. D. R. Shrestha
Mar. 18 - 19, 1992	Chyuntaha	- Installation of double drum winch cable way - Check and test operation	ditto
Mar. 20, 1992	Kathmandu	- Lecture on observation system	
Mar. 21 - 23, 1992	Tatopani	- Installation of double drum winch cable way - Check and test operation - Installation guidance of pressure type water level gauge	Mr. D. R. Shrestha
Mar. 24, 1992	Kolbhi	- Inspection of raingauge station	Mr. T. R. Shakya
Mar. 25, 1992	Chyuntaha	- Installation of float type water level gauge	ditto

Table 6.8 (2) FIELD ACTIVITIES OF MODEL OBSERVATION

During Third Field Study (May 15 - July 13, 1992) (1 / 2)

Data	Place	Activities	Attendance of DHM
May 25 - 27, 1992	Sallyan	- Installation of weighing-type Raingauge	Mr. S. B. Prajapati (Hydrologist)
May 27 ,1992	Pamdur	- Rainfall data collection of data logger	Mr. R. K. Adhikari/ Jyoti shankar C. M. Pahari/Purna Raj
June 3 - 6, 1992	Tatopani Setibeni Kalleri	- Inspection of water level gauge station - Installation of wire-less set at Tatopani	Mr. S. B. Prajapati
June 7 - 9, 1992	Chyuntaha	- Inspection of water level and rain gauge station - Installation of weighing-type rain gauge - Discharge measurement (wading rod)	Mr. T. R. Shakya
June 10 ,1992	Kolbhi	- Inspection of rain gauge station	ditto
June 11 - 12, 1992	Kathmandu	- Lecture on observation system	Seven (7) trainees
June 15 - 17, 1992	Kalleri Pamdur	- Field training at Kalleri and Pamdur (observation and data transfer of data logger)	Mr. S. B. Prajapati & nine (9) trainees
	Pokhara	- Data processing of data logger	ditto
June 18 ,1992	Tisedi	- Inspection of weighing-type Raingauge	Mr. C. H. Pahari
June 20 - 23, 1992	Tatopani	- Inspection of water level gauge station - Discharge measurement (double drum winch) The propeller was damaged due to attack against big boulders	Mr. S. B. Prajapati Mr. D. K. Shrestha Mr. K. R. Adhikari
June 24 - 28, 1992	Setibeni	- Inspection of water level gauge station - Discharge measurement (Cable Car) - Float measurement - Suspended sediment sampling	ditto

Table 6.8 (3) FIELD ACTIVITIES OF MODEL OBSERVATION

During Third Field Study (May 15 - July 13, 1992) (2 / 2)

Data	Place	Activities	Attendance of DHM
June 29 - 30, 1992	Kalleri	- Inspection of water level gauge station - Discharge measurement (duble -drum-winch - Data collection of data logger	Mr. S. B. Prajapati Mr. D. K. Shrestha Mr. K. R. Adhikari and fifteen (15) DHM trainees
July 1, 1992	Sallyan Pamdur	- Inspection of rain gauge station - Data collection of data logger at Pamdur	ditto
July 2, 1992	Pokhara	- Data processing of data logger	ditto
July 5, 1992	Chyuntaha	- Inspection of water level and rain gauge station - Discharge measurement (wading rod) - Calibration of weighing-type rain gauge	Mr. L. K. Shrestha Mr. T. R. Shakya
July 6, 1992	Kolbhi	- Inspection of rain gauge station - Calibration of weighing-type	ditto

Table 6.8 (4) FIELD ACTIVITIES OF MODEL OBSERVATION

During fourth field study (Sept. 22 - Nov. 18, 1992) (1 / 2)

Data	Place	Activities	Attendance of DHM
Sept. 24, 1992	Kalleri-Setibeni	- Inspection of water level gauge station	Mr. S. B. Prajapati
Oct. 12 - 14, 1992	Tatopani	- Inspection of water level gauge station - float measurement, Senson protection pipe and 1m staff gauge was washed away.	Mr. S. B. Prajapati Mr. Purna Raj Mr. Kamal Adhikari
Oct. 15 - 18, 1992	Setibeni	- Inspection of water level station - Discharge measurement (cable car) - Float measurement - Suspended sediment sampling	ditto
Oct. 19 - 20, 1992	Kalleri	- Inspection of water level gauge station - Discharge measurement (duble-drum winch) - Data collection from data logger	ditto
Oct. 22, 1992	Pamdur	- Inspection of raingauge station Data collection from data logger Overflow of memory (>3000mm accumulating rainfall) (stopped on 15th Oct. 1992)	ditto
Oct 22 - 23, 1992	Pokhara	- Sediment Analysis (suspended sediment at Setibeni)	Mr. Gautum
Oct. 23, 1992	Sallyan	- Check of weighing-type Raingauge	Mr. R. K. Adhikari
Oct. 24 - 25, 1992	Tinau/Butwal	- Inspection of DHM water level gauging station - Inspection for site relocation of station	Mr. S. B. Prajapati Mr. Gautum
Oct. 26, 1992	Narayani/ Narayanghat	- Inspection of DHM water level gaugingstation	ditto
Oct. 30 - 31, 1992	Chyuntaha	- Inspection of water level and rain gauge station - Inspection for site relocation of raingauge station - Discharge measurement (wading rod) - Adjustment of weighing-type raingauge	Mr. Suresh Hamal Mr. Durga Ghimere

Table 6.8 (5) FIELD ACTIVITIES OF MODEL OBSERVATION

During fourth field study (Sept. 22 - Nov. 18, 1992) (2 / 2)

Data	Place	Activities	Attendance of DHM
Nov. 1, 1992	Kolbhi	- Inspection of rain gauge station - Inspection for site relocation of raingauge station	Mr. Suresh Hamal Mr. Durga Ghimire
Nov. 2 - 3, 1992	Sallyan	Calibration of weighing-type raingauge	Mr. A. Bista (Meteo. Mechanic) Mr. R. K. Adhikari Mr. Jyoti Shankar
Nov. 4 - 5, 1992	Sirkang	Calbration of weighing-type raingauge (trained by Mr. A. Bista)	ditto
Nov. 4, 1992	Tatopani - Setibeni	Inspection of water level gauge station	Mr. S. B. Prajapati

Table 7.1 MINIMUM RAINGAUGE NETWORK (1/2)

No	River Basin	Basin Area (sq.km)	Basin Area below EL.4000 (sq.km)		Basin Area (sq.km)	Number of Existing Gauge	Minimum Required Number	Number of Deficit	Model System	Proposed Number to be Added	Existing Recorder	Number of Required Recorder	Proposed Recorder to be Added
1	I MAHAKALI RIVER	5,317	4,360	M	4,180	6	17	11		11	1	2	1
				T	180	0	0	0		0	0	0	0
2	II SOUTHERN BORDER RIVER GROUP NO.1	3,811	3,810	M	660	0	3	3		3	0	0	0
				T	3,150	8	4	-5		2	1	1	1
	III KARNALI RIVER												
3	1 HUMLA KARNALI	5,527	1,600	M	1,600	2	6	4		4	0	1	1
				T	0	0	0	0		0	0	0	0
4	2 MUGU KARNALI	6,155	1,480	M	1,480	1	6	5		5	0	1	1
				T	0	0	0	0		0	0	0	0
5	3 SINJATILA	3,252	2,570	M	2,570	4	10	6		6	1	1	0
				T	0	0	0	0		0	0	0	0
6	4 SETI WEST	7,103	5,820	M	5,820	8	23	15		15	0	2	2
				T	0	0	0	0		0	0	0	0
7	5 BHERI	13,867	9,290	M	9,290	9	37	28		28	1	4	3
				T	0	0	0	0		0	0	0	0
8	6 KARNALI MAIN(OTHERS)	7,323	6,960	M	6,230	12	25	13		13	0	3	3
				T	730	3	1	-2		0	0	0	0
9	IV BABAI RIVER	3,252	3,250	M	2,630	7	11	4		4	1	1	0
				T	620	1	1	0		0	0	0	0
10	V SOUTHERN BORDER RIVER GROUP NO.2	948	950	M	50	0	0	0		0	0	0	0
				T	900	3	1	-2		1	0	0	1
11	VI RAPTI(WEST) RIVER	6,215	6,220	M	5,710	5	23	18		18	0	2	1
				T	510	0	1	1		1	0	0	0
12	VII SOUTHERN BORDER RIVER GROUP NO.3	4,849	4,850	M	1,150	2	5	3		3	0	1	1
				T	3,700	9	4	-5		2	1	1	0
	VIII NARAYANI/GANDAKI RIVER												
13	1 TRISULI	3,622	2,900	M	2,900	9	12	3		3	0	1	1
				T	0	0	0	0		0	0	0	0
14	2 BUDHI	3,621	2,300	M	2,300	3	9	6		6	0	1	1
				T	0	0	0	0		0	0	0	0
15	3 MARSYANGDI	4,819	2,680	M	2,680	6	11	5		5	0	1	1
				T	0	0	0	0		0	0	0	0
16	4 SETI GANDAKI	2,843	2,620	M	2,620	7	10	3	1	3	1	1	0
				T	0	0	0	0		0	0	0	0
17	5 KALI GANDAKI	11,573	8,330	M	8,330	29	33	4	11	10	0	3	1
				T	0	0	0	0		0	0	0	0
18	6 RAPTI(GANDAKI)	2,993	2,990	M	2,990	6	12	6		6	0	1	1
				T	0	0	0	0		0	0	0	0
19	7 NARAYANI/GANDAKI MAIN(OTHERS)	2,255	2,260	M	2,130	3	9	6		6	0	1	1
				T	130	0	0	0		0	0	0	0
20	IX SOUTHERN BORDER RIVER GROUP NO.4	3,502	3,500	M	680	0	3	3		3	0	0	0
				T	2,820	6	3	-3	2	1	1	0	0
21	X BAGMATI RIVER	3,681	3,680	M	2,740	14	11	-3		7	1	1	1
				T	940	3	1	-2		0	0	0	0
22	XI SOUTHERN BORDER RIVER GROUP NO.5	3,013	3,010	M	120	0	0	0		0	0	0	0
				T	2,890	7	3	-4		0	0	0	1

Table 7.1 MINIMUM RAINGAUGE NETWORK (2/2)

No	River Basin	Basin Area (sq.km)	Basin Area below EL.4000 (sq.km)		Basin Area (sq.km)	Number of Existing Gauge	Minimum Required Number	Number of Deficit	Model System	Proposed Number to be Added	Existing Recorder	Number of Required Recorder	Proposed Recorder to be Added
23	XII KAMALA RIVER	1,786	1,790	M	1,110	2	4	2		4	0	1	1
				T	680	1	1	0		0	0	0	0
24	XIII SOUTHERN BORDER RIVER GROUP NO.6	1,896	1,900	M	0	0	0	0		0	0	0	0
				T	1,900	2	2	0		0	0	0	0
	XIV SUN KOSHI/SAPTA KOSHI RIVER												
25	1 BHOTE KOSHI	240	220	M	220	1	1	0		0	0	0	0
				T	0	0	0	0		0	0	0	0
26	2 TAMA KOSHI	2,714	2,060	M	2,060	4	8	4		4	0	1	1
				T	0	0	0	0		0	0	0	0
27	3 DUDH KOSHI	4,030	2,300	M	2,300	8	9	1		1	1	1	0
				T	0	0	0	0		0	0	0	0
28	4 ARUN	5,248	4,330	M	4,330	10	17	7		7	1	2	1
				T	0	0	0	0		0	0	0	0
29	5 TAMUR/TAMAR	6,125	4,350	M	4,350	10	17	7		7	2	2	0
				T	0	0	0	0		0	0	0	0
30	6 SUN KOSHI MAIN(OTHERS)	9,506	8,940	M	8,090	24	32	8		11	0	3	3
				T	850	3	1	-2		0	0	0	1
31	XV SOUTHERN BORDER RIVER GROUP NO.7	3,462	3,460	M	350	0	1	1		2	0	0	0
				T	3,110	6	3	-3		1	1	0	0
32	XVI KANKAI RIVER	1,317	1,320	M	600	2	2	0		1	0	0	1
				T	720	1	1	0		0	0	0	0
33	XVII SOUTHERN BORDER RIVER GROUP NO.8	1,316	1,320	M	200	1	1	0		0	0	0	0
				T	1,120	4	1	-3		0	0	0	1
	TOTAL	147,181	117,420		117,420	252	396	178	14	204	14	40	32

Remarks:
M; Mountainous zone between EL.300m and EL.4000m (92,470 sq.km)
T; Terai zone below EL.300m (24,950 sq.km)

Table 7.2 LIST OF METEOROLOGICAL STATIONS OF PROPOSED MINIMUM NETWORK (1/5)

NO.	INDEX NO.	NAME OF STATION	TYPE OF STATION	RIVER BASIN	Reg. office	ELEVATION (m)	TYPE OF RECORDER EXIST	TYPE OF RECORDER PLAN	REMARKS
1	101	KAKERPAKHA	PRECIPITATION	I	FW	842			Existing
2	102	BAITADI	PRECIPITATION	I	FW	1,635			Existing
3	103	PATAN (WEST)	CLIMATOLOGY	I	FW	1,266			Existing
4	104	DANDELDHURA	SYNOPTIC	I	FW	1,865	WE	TP+d	Existing
5	107	DARCHULA	CLIMATOLOGY	I	FW	1,097		TP+d	Existing
6	108	SATBANJH	PRECIPITATION	I	FW	2,370			Existing
7	105	MAHENDRA NAGAR	AGROMETEOLOGY	II	FW	176		TP+d	Existing
8	106	BELAURI SANTIPUR	PRECIPITATION	II	FW	159			Existing
9	207	TIKAPUR	CLIMATOLOGY	II	FW	140			Existing
10	208	SANDEPANI	PRECIPITATION	II	FW	195			Existing
11	209	DHANGADHI	CLIMATOLOGY	II	FW	170			Existing
12	212	SITAPUR	PRECIPITATION	II	FW	152			Existing
13	215	GODAVARI (WEST)	CLIMATOLOGY	II	FW	288			Existing
14	219	DHANGADHI	SYNOPTIC	II	FW	170	NS+	TP+d	Existing
15	311	SIMIKOT	CLIMATOLOGY	III-1	MW	2,800		WE	Existing
16	313	DARMA	PRECIPITATION	III-1	MW	1,950			Existing
17	301	MUGU	PRECIPITATION	III-2	MW	3,803		WE	Existing
18	303	JUMLA	SYNOPTIC	III-3	MW	2,300	AC+	WE	Existing
19	304	GUTHI CHAUR	PRECIPITATION	III-3	MW	3,080			Existing
20	308	NAGMA	PRECIPITATION	III-3	MW	1,905			Existing
21	310	DIPAL GAUN	CLIMATOLOGY	III-3	MW	2,310			Existing
22	201	PIPALKOT	PRECIPITATION	III-4	FW	1,456			Existing
23	202	CHAINPUR (WEST)	CLIMATOLOGY	III-4	FW	1,304			Existing
24	203	SILGADHI DOTI	CLIMATOLOGY	III-4	FW	1,360			Existing
25	204	BAJURA	PRECIPITATION	III-4	FW	1,400			Existing
26	205	KATAI	PRECIPITATION	III-4	FW	1,388			Existing
27	211	KHAPTAD	PRECIPITATION	III-4	FW	3,430		WE	Existing
28	217	MANGALSEN	PRECIPITATION	III-4	FW	1,345			Existing
29	218	DIPAYAL (DOTI)	SYNOPTIC	III-4	FW	617		TP+d	Existing
30	312	DUNAI	CLIMATOLOGY	III-5	MW	2,058		TP	Existing
31	403	JAMU (TIKUWA KUNA)	PRECIPITATION	III-5	MW	260			Existing
32	404	JAJARKOT	PRECIPITATION	III-5	MW	1,231			Existing
33	406	SURKHET(BIRENDRA NAGAR)	SYNOPTIC	III-5	MW	720	WE	TP+d	Existing
34	418	MAINA GAUN (D.BAS)	PRECIPITATION	III-5	MW	2,000		TP+d	Existing
35	501	RUKUMKOT	PRECIPITATION	III-5	MW	1,560			Existing
36	502	SHERA GAUN	PRECIPITATION	III-5	MW	2,150			Existing
37	513	CHAUR JHARI TAR	CLIMATOLOGY	III-5	MW	910			Existing
38	514	MUSIKOT (RUKUMKOT)	CLIMATOLOGY	III-5	MW	2,100		TP+d	Existing
39	206	ASARA GHAT	PRECIPITATION	III-6	FW	650			Existing
40	210	BANGGA CAMP	CLIMATOLOGY	III-6	FW	340			Existing
41	214	KOLA GAUN	PRECIPITATION	III-6	FW	1,304			Existing
42	302	THIBRU	PRECIPITATION	III-6	MW	1,006			Existing
43	305	SHERI GHAT	PRECIPITATION	III-6	MW	1,210			Existing
44	306	GAM SHREE NAGAR	PRECIPITATION	III-6	MW	2,133			Existing
45	307	RARA	CLIMATOLOGY	III-6	MW	3,048		WE	Existing
46	309	BIJAYAPUR (RASKOT)	PRECIPITATION	III-6	MW	1,814		TP+d	Existing
47	401	PUSMA CAMP	CLIMATOLOGY	III-6	MW	950		TP+d	Existing
48	402	DAILEKH	CLIMATOLOGY	III-6	MW	1,402			Existing
49	405	CHISAPANI (KARNALI)	CLIMATOLOGY	III-6	MW	225			Existing
50	410	BALE BUDHA	PRECIPITATION	III-6	MW	610			Existing
51	411	RAJAPUR	PRECIPITATION	III-6	MW	129			Existing
52	415	BARGADAHA	PRECIPITATION	III-6	MW	200			Existing
53	417	RANI JARUWA NURSERY	CLIMATOLOGY	III-6	MW	200			Existing
54	408	GULARIYA	PRECIPITATION	IV	MW	215			Existing
55	413	SHYANO SHREE	PRECIPITATION	IV	MW	302			Existing
56	507	NAYABASTI (DANG)	PRECIPITATION	IV	MW	698			Existing
57	508	TULSIPUR	CLIMATOLOGY	IV	MW	725			Existing
58	509	GHORAHI (MASINA)	PRECIPITATION	IV	MW	725			Existing
59	511	SALYAN BAZAR	CLIMATOLOGY	IV	MW	1,457			Existing
60	512	LUWAMJULA BAZAR	PRECIPITATION	IV	MW	885			Existing
61	515	GHORAI	SYNOPTIC	IV	MW	725	FS	TP+d	Existing
62	409	KHAJURA (NEPALGANJ)	AGROMETEOLOGY	V	MW	190			Existing
63	412	NAUBASTA	PRECIPITATION	V	MW	135			Existing
64	416	NEPALGUNJ (REG.OFF.)	CLIMATOLOGY	V	MW	144		TP+d	Existing
65	407	KUSUM	PRECIPITATION	VI	MW	235			Existing
66	414	BAIJAPUR	PRECIPITATION	VI	MW	226			Existing
67	419	SIKTA	AGROMETEOLOGY	VI	MW	195			Existing
68	504	LIBANG GAUN	PRECIPITATION	VI	MW	1,270			Existing
69	505	BIJUWAR TAR	PRECIPITATION	VI	MW	823		TP+d	Existing
70	510	LOILABAS	PRECIPITATION	VII	MW	320			Existing
71	702	TANSEN	CLIMATOLOGY	VII	W	1,067		TP+d	Existing
72	703	BUTWAL	CLIMATOLOGY	VII	W	205			Existing
73	705	BHAIRHAWA AIRPORT	AERONAUTICAL	VII	W	109	WE	TP+d	Existing
74	707	BHAIRHAWA (AGRIC)	AGROMETEOLOGY	VII	W	120			Existing
75	708	PARASI	PRECIPITATION	VII	W	125			Existing
76	716	TAULIHAWA	CLIMATOLOGY	VII	W	94			Existing
77	721	PATTHARKOT (WEST)	PRECIPITATION	VII	W	200			Existing
78	723	BHAGWANPUR	PRECIPITATION	VII	W	80			Existing
79	727	LUMBINI	PRECIPITATION	VII	W	95			Existing
80	728	SIMARI	CLIMATOLOGY	VII	W	154			Existing
81	1001	TIMURE	PRECIPITATION	VIII-1	C	1,900			Existing
82	1004	NUWAKOT	CLIMATOLOGY	VIII-1	C	1,003		TP+d	Existing
83	1005	DHADING	PRECIPITATION	VIII-1	C	1,420			Existing
84	1007	KAKANI	AGROMETEOLOGY	VIII-1	C	2,064			Existing
85	1038	DHUNIBESI	CLIMATOLOGY	VIII-1	C	1,085			Existing
86	1054	THAMACHIT	PRECIPITATION	VIII-1	C	1,847			Existing
87	1055	DHUNCHE	CLIMATOLOGY	VIII-1	C	1,982			Existing
88	1057	PANSAYAKHOLA	CLIMATOLOGY	VIII-1	C	1,240			Existing
89	1072	PAIGUTANG	CLIMATOLOGY	VIII-1	C	4,091			Existing
90	801	JAGAT (SETIBAS)	PRECIPITATION	VIII-2	W	1,334			Existing
91	806	LARKE SAMDO	PRECIPITATION	VIII-2	W	3,650			Existing
92	1002	ARU GHAT D. BAZAR	PRECIPITATION	VIII-2	C	518		TP+d	Existing
93	802	KHUDI BAZAR	CLIMATOLOGY	VIII-3	W	823		TP+d	Existing
94	807	KUNCHHA	PRECIPITATION	VIII-3	W	855			Existing
95	809	GORKHA	AGROMETEOLOGY	VIII-3	W	1,097			Existing
96	816	CHAME	CLIMATOLOGY	VIII-3	W	2,680			Existing
97	820	MANANG BHOT	PRECIPITATION	VIII-3	W	3,420			Existing
98	823	GHAREDHUNGA	PRECIPITATION	VIII-3	W	1,120			Existing
99	804	POKHARA AIRPORT	AERONAUTICAL	VIII-4	W	827	WE+	TP+d	Existing
100	808	BANDIPUR	PRECIPITATION	VIII-4	W	965			Existing
101	811	MALEPATAN (POKHARA)	AGROMETEOLOGY	VIII-4	W	856			Existing
102	815	KHAIRINI TAR	AGROMETEOLOGY	VIII-4	W	500			Existing
103	817	DAMAULI	PRECIPITATION	VIII-4	W	358			Existing
104	818	LAMACHAUR	PRECIPITATION	VIII-4	W	1,070			Existing
105	824	SIKLESH	PRECIPITATION	VIII-4	W	1,820			Existing
106	601	JOMSOM	CLIMATOLOGY	VIII-5	W	2,744			Existing
107	604	THAKMARPHA	AGROMETEOLOGY	VIII-5	W	2,566			Existing
108	605	BAGLUNG	CLIMATOLOGY	VIII-5	W	984			Existing

Table 7.2 LIST OF METEOROLOGICAL STATIONS OF PROPOSED MINIMUM NETWORK (2/5)

NO.	INDEX NO.	NAME OF STATION	TYPE OF STATION	RIVER BASIN	Reg. offi-ce	ELE-VATION (m)	TYPE OF RECORDER EXIST	TYPE OF RECORDER PLAN	REMARKS
109	606	TATOPANI	PRECIPITATION	VIII-5	W	1,243			Existing
110	607	LETE	PRECIPITATION	VIII-5	W	2,384			Existing
111	608	RANIPAUWA (M.NATH)	PRECIPITATION	VIII-5	W	3,609			Existing
112	609	BENI BAZAR	CLIMATOLOGY	VIII-5	W	835			Existing
113	610	GHAMI (MUSTANG)	PRECIPITATION	VIII-5	W	3,465			Existing
114	612	MUSTANG (LOMANGTANG)	CLIMATOLOGY	VIII-5	W	3,705			Existing
115	613	KARKI NETA	PRECIPITATION	VIII-5	W	1,720			Existing
116	614	KUSHMA	CLIMATOLOGY	VIII-5	W	891			Existing
117	615	BOBANG	PRECIPITATION	VIII-5	W	2,273			Existing
118	616	GURJA KHANI	PRECIPITATION	VIII-5	W	2,530			Existing
119	619	GHORAPANI	PRECIPITATION	VIII-5	W	2,742			Existing
120	620	TRIBENI	PRECIPITATION	VIII-5	W	1,000			Existing
121	621	DARBANG	PRECIPITATION	VIII-5	W	1,500			Existing
122	622	RANGKHANI	PRECIPITATION	VIII-5	W	1,500			Existing
123	701	RIDI BAZAR	PRECIPITATION	VIII-5	W	442			Existing
124	715	KHANCHIKOT	CLIMATOLOGY	VIII-5	W	1,760			Existing
125	722	MUSIKOT	PRECIPITATION	VIII-5	W	1,280			Existing
126	725	TAMGHAS	CLIMATOLOGY	VIII-5	W	1,530		TP+d	Existing
127	726	GARAKOT	PRECIPITATION	VIII-5	W	500			Existing
128	805	SYANGJA	CLIMATOLOGY	VIII-5	W	868			Existing
129	810	CHAPKOT	CLIMATOLOGY	VIII-5	W	460			Existing
130	813	BHADAURE DEURALI	PRECIPITATION	VIII-5	W	1,600			Existing
131	814	LUMLE	AGROMETEOLOGY	VIII-5	W	1,740			Existing
132	821	GHANDRUK	PRECIPITATION	VIII-5	W	1,960			Existing
133	826	WALLING	PRECIPITATION	VIII-5	W	750			Existing
134	827	RUMJAKOT	PRECIPITATION	VIII-5	W	660			Existing
135	902	RAMPUR	AGROMETEOLOGY	VIII-6	C	256			Existing
136	903	JHAWANI	PRECIPITATION	VIII-6	C	270		TP+d	Existing
137	904	CHISAPANI GADHI	PRECIPITATION	VIII-6	C	1,706			Existing
138	906	HETAUNDA N.F.I.	CLIMATOLOGY	VIII-6	C	474			Existing
139	919	MAKWANPUR GADHI	PRECIPITATION	VIII-6	C	1,030			Existing
140	920	BELUWA	PRECIPITATION	VIII-6	C	274			Existing
141	704	BELUWA (GIRWARI)	PRECIPITATION	VIII-7	W	150		TP+d	Existing
142	706	DUMKAULI	AGROMETEOLOGY	VIII-7	W	154			Existing
143	710	DUMKIBAS	PRECIPITATION	VIII-7	W	164			Existing
144	907	AMLEKHGANJ	PRECIPITATION	IX	C	396			Existing
145	909	SIMARA AIRPORT	AERONAUTICAL	IX	C	130	NS	TP+d	Existing
146	910	NIJGADH	PRECIPITATION	IX	C	244			Existing
147	911	PARWANIPUR	AGROMETEOLOGY	IX	C	115			Existing
148	918	BIRGANJ	PRECIPITATION	IX	C	91			Existing
149	921	KALAIYA	PRECIPITATION	IX	C	140			Existing
150	905	DAMAN	CLIMATOLOGY	X	C	2,314			Existing
151	912	RAMOLI BARIYA	PRECIPITATION	X	C	152			Existing
152	915	KARKHU GAUN	PRECIPITATION	X	C	1,530			Existing
153	922	GAUR	CLIMATOLOGY	X	C	90			Existing
154	1015	THANKOT	PRECIPITATION	X	C	1,630			Existing
155	1022	GODAVARI	CLIMATOLOGY	X	C	1,400			Existing
156	1029	KHUMALTAR	AGROMETEOLOGY	X	C	1,350			Existing
157	1030	KATHMANDU AIRPORT	AERONAUTICAL	X	C	1,336	NS	TP+d	Existing
158	1035	SANKHU	PRECIPITATION	X	C	1,449			Existing
159	1039	PANIPOKARI (KATHMANDU)	CLIMATOLOGY	X	C	1,335			Existing
160	1043	NAGARKOT	CLIMATOLOGY	X	C	2,163			Existing
161	1052	BHAKTAPUR	PRECIPITATION	X	C	1,330			Existing
162	1059	CHANGU NARAYAN	PRECIPITATION	X	C	1,543			Existing
163	1060	CHAPA GAUN	PRECIPITATION	X	C	1,448			Existing
164	1071	BUDDHANILAKANTHA	CLIMATOLOGY	X	C	1,360			Existing
165	1117	HARIHARPUR GADHI VALLEY	PRECIPITATION	X	C	250		TP+d	Existing
166	1121	KARMAIYA	CLIMATOLOGY	X	C	131			Existing
167	1109	PATTHARKOT (EAST)	PRECIPITATION	XI	C	275			Existing
168	1110	TULSI	PRECIPITATION	XI	C	457			Existing
169	1111	JANAKPUR AIRPORT	CLIMATOLOGY	XI	C	90			Existing
170	1118	MANUSMARA	CLIMATOLOGY	XI	C	100			Existing
171	1119	GAUSALA	PRECIPITATION	XI	C	200			Existing
172	1120	MALANGWA	PRECIPITATION	XI	C	150			Existing
173	1122	JALESORE	CLIMATOLOGY	XI	C	61		TP+d	Existing
174	1112	CHISAPANI BAZAR	PRECIPITATION	XII	C	165		TP+d	Existing
175	1213	UDAYAPUR GADHI	CLIMATOLOGY	XII	E	1,175			Existing
176	1216	SIRAHA	PRECIPITATION	XII	E	102			Existing
177	1215	LAHAN	CLIMATOLOGY	XIII	E	138			Existing
178	1223	RAJBIRAJ	CLIMATOLOGY	XIII	E	91			Existing
179	1006	GUMTHANG	PRECIPITATION	XIV-1	C	2,000			Existing
180	1101	NAGDAHA	PRECIPITATION	XIV-2	C	850			Existing
181	1102	CHARIKOT	PRECIPITATION	XIV-2	C	1,940			Existing
182	1103	JIRI	AGROMETEOLOGY	XIV-2	C	2,003		TP+d	Existing
183	1104	MELUNG	PRECIPITATION	XIV-2	C	1,536			Existing
184	1202	CHAURIKHARK	PRECIPITATION	XIV-3	E	2,619			Existing
185	1203	PAKARNAS	PRECIPITATION	XIV-3	E	1,982			Existing
186	1204	AISEALUKHARK	PRECIPITATION	XIV-3	E	2,143			Existing
187	1206	OKHALDHUNGA	SYNOPTIC	XIV-3	E	1,720	NS	TP+d	Existing
188	1207	NAME BHANJYANG	PRECIPITATION	XIV-3	E	1,567			Existing
189	1217	KHUMJUNG	PRECIPITATION	XIV-3	E	3,750			Existing
190	1219	SALLERI	PRECIPITATION	XIV-3	E	2,378			Existing
191	1220	CHIALSA	AGROMETEOLOGY	XIV-3	E	2,770			Existing
192	1301	NUM	PRECIPITATION	XIV-4	E	1,497		TP+d	Existing
193	1303	CHAINPUR (EAST)	CLIMATOLOGY	XIV-4	E	1,329			Existing
194	1304	PAKHRIBAS	AGROMETEOLOGY	XIV-4	E	1,680	FS+	TP+d	Existing
195	1305	LEGUWA GHAT	PRECIPITATION	XIV-4	E	410			Existing
196	1306	MUNGA	PRECIPITATION	XIV-4	E	1,317			Existing
197	1317	CHEPUWA	PRECIPITATION	XIV-4	E	2,590			Existing
198	1321	TUMLINGTAR	PRECIPITATION	XIV-4	E	303			Existing
199	1322	MACHUWAGHAT	PRECIPITATION	XIV-4	E	158			Existing
200	1324	BHOJPUR	AGROMETEOLOGY	XIV-4	E	1,595			Existing
201	1325	DINGLA	PRECIPITATION	XIV-4	E	1,190			Existing
202	1307	DHANKUTA	SYNOPTIC	XIV-5	E	1,447	WE	TP+d	Existing
203	1308	MUL GHAT	PRECIPITATION	XIV-5	E	365			Existing
204	1309	TRIBENI	PRECIPITATION	XIV-5	E	143			Existing
205	1314	TERMATHUM	CLIMATOLOGY	XIV-5	E	1,633			Existing
206	1403	LUNGTHUNG	PRECIPITATION	XIV-5	E	1,780			Existing
207	1404	TAPLETHOK	PRECIPITATION	XIV-5	E	1,383			Existing
208	1405	TAPLEJUNG	SYNOPTIC	XIV-5	E	1,732	WE	TP+d	Existing
209	1406	MEMENG JAGAT	PRECIPITATION	XIV-5	E	1,830			Existing
210	1419	PHIDIM (PANCHTHER)	CLIMATOLOGY	XIV-5	E	1,205			Existing
211	1420	DOVAN	PRECIPITATION	XIV-5	E	763			Existing
212	1008	NAWALPUR	PRECIPITATION	XIV-6	C	1,592			Existing
213	1009	CHAUTARA	PRECIPITATION	XIV-6	C	1,660			Existing
214	1016	SARMATHANG	CLIMATOLOGY	XIV-6	C	2,625		WE	Existing
215	1017	DUBACHAUR	PRECIPITATION	XIV-6	C	1,550			Existing
216	1018	BAUNEPATI	PRECIPITATION	XIV-6	C	845			Existing

Table 7.2 LIST OF METEOROLOGICAL STATIONS OF PROPOSED MINIMUM NETWORK (3/5)

NO.	INDEX NO.	NAME OF STATION	TYPE OF STATION	RIVER BASIN	Reg. of fi-ce	ELE-VATION (m)	TYPE OF RECORDER EXIST	PLAN	REMARKS
217	1020	MANDAN	PRECIPITATION	XIV-6	C	1,365			Existing
218	1023	DOLAL GHAT	PRECIPITATION	XIV-6	C	710			Existing
219	1024	DHULIKHEL	CLIMATOLOGY	XIV-6	C	1,552			Existing
220	1025	DHAP	PRECIPITATION	XIV-6	C	1,240			Existing
221	1027	BAHRABISE	PRECIPITATION	XIV-6	C	1,220			Existing
222	1028	PACHUWAR GHAT	PRECIPITATION	XIV-6	C	633			Existing
223	1036	PANCHKHAL	AGROMETEOLOGY	XIV-6	C	865			Existing
224	1049	KHOPASI (PANAUTI)	PRECIPITATION	XIV-6	C	1,517			Existing
225	1058	TARKE GHYANG	PRECIPITATION	XIV-6	C	2,480			Existing
226	1062	SANGACHOK	CLIMATOLOGY	XIV-6	C	1,327		TP+d	Existing
227	1063	THOKARPA	PRECIPITATION	XIV-6	C	1,750			Existing
228	1106	RAMECHHAP	PRECIPITATION	XIV-6	C	1,395			Existing
229	1107	SINDHULI GADHI	CLIMATOLOGY	XIV-6	C	1,463		TP+d	Existing
230	1108	BAHUN TILPUNG	PRECIPITATION	XIV-6	C	1,417			Existing
231	1115	NEPALTHOK	PRECIPITATION	XIV-6	C	1,098			Existing
232	1210	KURULE GHAT	PRECIPITATION	XIV-6	E	497			Existing
233	1211	KHOTANG BAZAR	PRECIPITATION	XIV-6	E	1,295			Existing
234	1212	PHATEPUR	CLIMATOLOGY	XIV-6	E	100		TP+d	Existing
235	1222	DIKTEL	PRECIPITATION	XIV-6	E	1,623			Existing
236	1224	SIRWA	PRECIPITATION	XIV-6	E	1,662			Existing
237	1226	BARMAJHIYA	PRECIPITATION	XIV-6	E	85			Existing
238	1316	CHATARA	PRECIPITATION	XIV-6	E	183			Existing
239	1311	DHARAN BAZAR	PRECIPITATION	XV	E	444			Existing
240	1312	HARAINCHA	PRECIPITATION	XV	E	152			Existing
241	1319	BIRATNAGAR AIRPOART	AERONAUTICAL	XV	E	72	FS+	TP+d	Existing
242	1320	TARAHARA	AGROMETEOLOGY	XV	E	200			Existing
243	1323	DHARAN BRITISH CAMP	CLIMATOLOGY	XV	E	400			Existing
244	1408	DAMAK	PRECIPITATION	XV	E	163			Existing
245	1407	ILAM TEA ESTATE	AGROMETEOLOGY	XVI	E	1,300		TP+d	Existing
246	1410	HIMALI GAUN	PRECIPITATION	XVI	E	1,654			Existing
247	1411	SOKTIM TEA ESTATE	CLIMATOLOGY	XVI	E	530			Existing
248	1409	ANARMANI BIRTA	PRECIPITATION	XVII	E	122			Existing
249	1412	CHANDRA GADHI	PRECIPITATION	XVII	E	120			Existing
250	1415	SANISCHARE	PRECIPITATION	XVII	E	168			Existing
251	1416	KANYAM TEA ESTATE	CLIMATOLOGY	XVII	E	1,678			Existing
252	1421	GAIDA (KANKAI)	CLIMATOLOGY	XVII	E	143		TP+d	Existing
253	623	YARAGAU	PRECIPITATION	VIII-5	W	3,620	WE		Model system
254	624	SAMARGAU	PRECIPITATION	VIII-5	W	3,570	WE		Model system
255	625	DAKARJUNG	PRECIPITATION	VIII-5	W	3,160	WE		Model system
256	626	BEGA	PRECIPITATION	VIII-5	W	1,770	WE		Model system
257	627	KUHUN	PRECIPITATION	VIII-5	W	1,550	WE		Model system
258	628	MUNA	PRECIPITATION	VIII-5	W	1,970	WE		Model system
259	629	BAGHARA	PRECIPITATION	VIII-5	W	2,330	WE		Model system
260	630	SIRKON	PRECIPITATION	VIII-5	W	790	WE		Model system
261	828	KHULDI DOBAN	PRECIPITATION	VIII-5	W	2,400	WE		Model system
262	829	SALLYAN	PRECIPITATION	VIII-5	W	1,460	WE		Model system
263	830	PAMDUR	PRECIPITATION	VIII-4	W	1,160	TP+d		Model system
264	831	TISEDI	PRECIPITATION	VIII-5	W	1,100	WE		Model system
265	923	KOLBHI	PRECIPITATION	IX	C	109	WE		Model system
266	924	CHYUNTAHA	PRECIPITATION	IX	C	86	WE		Model system
267	2000	GHANGRU	PRECIPITATION	I	FW	3,500			Newly Proposed
268	2001	CANETI	PRECIPITATION	I	FW	3,000			Newly Proposed
269	2002	GHUSA	PRECIPITATION	I	FW	2,500			Newly Proposed
270	2003	SIPH	PRECIPITATION	I	FW	2,100			Newly Proposed

NO.	INDEX NO.	NAME OF STATION	TYPE OF STATION	RIVER BASIN	Reg. of fi-ce	ELE-VATION (m)	TYPE OF RECORDER EXIST	PLAN	REMARKS
271	2004	KOTILA	PRECIPITATION	I	FW	2,100			Newly Proposed
272	2005	DUMLTH	PRECIPITATION	I	FW	2,000			Newly Proposed
273	2006	GULTHADI	PRECIPITATION	I	FW	1,900			Newly Proposed
274	2007	RUPAL	PRECIPITATION	I	FW	1,400			Newly Proposed
275	2008	BINAYAK	PRECIPITATION	I	FW	800			Newly Proposed
276	2009	DIAMA	PRECIPITATION	I	FW	800			Newly Proposed
277	2010	JOGBUDA	PRECIPITATION	I	FW	600			Newly Proposed
278	2011	BANDABAI	PRECIPITATION	II	FW	1,050			Newly Proposed
279	2012	HATTIDHUNGA	PRECIPITATION	II	FW	800			Newly Proposed
280	2013	SIMTI	PRECIPITATION	II	FW	750			Newly Proposed
281	2014	RAMPURA	PRECIPITATION	II	FW	320			Newly Proposed
282	2015	KAL	PRECIPITATION	II	FW	100			Newly Proposed
283	2016	MUNCHU	PRECIPITATION	III-1	MW	3,500			Newly Proposed
284	2017	LEPCHACHAUR	PRECIPITATION	III-1	MW	3,300			Newly Proposed
285	2018	RIP	PRECIPITATION	III-1	MW	2,700			Newly Proposed
286	2019	SHRINAGA	PRECIPITATION	III-1	MW	1,600			Newly Proposed
287	2020	BHANJYAN	PRECIPITATION	III-2	MW	4,200			Newly Proposed
288	2021	KUWANGAU	PRECIPITATION	III-2	MW	4,100			Newly Proposed
289	2022	HALEKHARK	PRECIPITATION	III-2	MW	3,200			Newly Proposed
290	2023	BANGU	PRECIPITATION	III-2	MW	3,000			Newly Proposed
291	2024	SIDDHI	PRECIPITATION	III-2	MW	2,000			Newly Proposed
292	2025	NAPHUKANA	PRECIPITATION	III-3	MW	3,100			Newly Proposed
293	2026	MACHHATU	PRECIPITATION	III-3	MW	3,000			Newly Proposed
294	2027	RIYAN	PRECIPITATION	III-3	MW	3,000			Newly Proposed
295	2028	SANIGAU	PRECIPITATION	III-3	MW	2,700			Newly Proposed
296	2029	DILTIKAT	PRECIPITATION	III-3	MW	2,000			Newly Proposed
297	2030	MANMA	PRECIPITATION	III-3	MW	1,050			Newly Proposed
298	2031	KUNDAGOTH	PRECIPITATION	III-4	FW	3,700			Newly Proposed
299	2032	DAHACHAUR	PRECIPITATION	III-4	MW	3,300			Newly Proposed
300	2033	THALARA	PRECIPITATION	III-4	FW	2,700			Newly Proposed
301	2034	WATAUDI	PRECIPITATION	III-4	FW	2,300			Newly Proposed
302	2035	DAGUN	PRECIPITATION	III-4	FW	2,300			Newly Proposed
303	2036	RAISALLR	PRECIPITATION	III-4	FW	2,000			Newly Proposed
304	2037	JADIGANDA	PRECIPITATION	III-4	FW	2,000			Newly Proposed
305	2038	DAIPASILA	PRECIPITATION	III-4	FW	2,000			Newly Proposed
306	2039	SUNKADA	PRECIPITATION	III-4	FW	1,600			Newly Proposed
307	2040	MARTADI	PRECIPITATION	III-4	FW	1,600			Newly Proposed
308	2041	SATPHERI	PRECIPITATION	III-4	FW	1,400			Newly Proposed
309	2042	DARBA	PRECIPITATION	III-4	FW	1,300			Newly Proposed
310	2043	KHATERA	PRECIPITATION	III-4	FW	1,000			Newly Proposed
311	2044	SAPHEBAGAR	PRECIPITATION	III-4	FW	1,000			Newly Proposed
312	2045	GOLMA	PRECIPITATION	III-4	FW	700			Newly Proposed
313	2046	MANDUWAGA	PRECIPITATION	III-5	MW	4,000			Newly Proposed
314	2047	TARANGAU	PRECIPITATION	III-5	MW	3,900			Newly Proposed
315	2048	KHANIGAU	PRECIPITATION	III-5	MW	3,400			Newly Proposed
316	2049	MOTIGOTH	PRECIPITATION	III-5	MW	3,000			Newly Proposed
317	2050	CHHACHUKOT	PRECIPITATION	III-5	MW	3,000			Newly Proposed
318	2051	BANTHART	PRECIPITATION	III-5	MW	2,900			Newly Proposed
319	2052	PAHAR	PRECIPITATION	III-5	MW	2,800			Newly Proposed
320	2053	BHUJI	PRECIPITATION	III-5	MW	2,800			Newly Proposed
321	2054	JATSUMARA	PRECIPITATION	III-5	MW	2,500			Newly Proposed
322	2055	JUPHAL	PRECIPITATION	III-5	MW	2,300			Newly Proposed
323	2056	SYAIBHULSAN	PRECIPITATION	III-5	MW	2,000			Newly Proposed
324	2057	DHARMASHATA	PRECIPITATION	III-5	MW	2,000			Newly Proposed

Table 7.2 LIST OF METEOROLOGICAL STATIONS OF PROPOSED MINIMUM NETWORK (4/5)

NO.	INDEX NO.	NAME OF STATION	TYPE OF STATION	RIVER BASIN	Reg. office	ELEVATION (m)	TYPE OF RECORDER EXIST	TYPE OF RECORDER PLAN	REMARKS
325	2058	PARJODAR	PRECIPITATION	III-5	MW	1,900			Newly Proposed
326	2059	KHARAN	PRECIPITATION	III-5	MW	1,800			Newly Proposed
327	2060	KABRENETA	PRECIPITATION	III-5	MW	1,800			Newly Proposed
328	2061	RAUTGAU	PRECIPITATION	III-5	MW	1,700			Newly Proposed
329	2062	CHIRAGAU	PRECIPITATION	III-5	MW	1,700			Newly Proposed
330	2063	THAL	PRECIPITATION	III-5	MW	1,500			Newly Proposed
331	2064	BHARMA	PRECIPITATION	III-5	MW	1,500			Newly Proposed
332	2065	PAKHAPANI	PRECIPITATION	III-5	MW	1,200			Newly Proposed
333	2066	GUA	PRECIPITATION	III-5	MW	1,200			Newly Proposed
334	2067	CHARKULI	PRECIPITATION	III-5	MW	1,200			Newly Proposed
335	2068	PIPALTA	PRECIPITATION	III-5	MW	1,050			Newly Proposed
336	2069	CHAURJAHADI	PRECIPITATION	III-5	MW	900			Newly Proposed
337	2070	MAJHKHARK	PRECIPITATION	III-5	MW	900			Newly Proposed
338	2071	CHHINYU	PRECIPITATION	III-5	MW	700			Newly Proposed
339	2072	SHRICHAUR	PRECIPITATION	III-5	MW	600			Newly Proposed
340	2073	CHAPON	PRECIPITATION	III-5	MW	400			Newly Proposed
341	2074	SAIN	PRECIPITATION	III-6	FW	3,800			Newly Proposed
342	2075	NIGAIKOT	PRECIPITATION	III-6	MW	2,500			Newly Proposed
343	2076	MUMRA	PRECIPITATION	III-6	MW	2,200			Newly Proposed
344	2077	YUNA	PRECIPITATION	III-6	FW	2,200			Newly Proposed
345	2078	NAKHARJI	PRECIPITATION	III-6	MW	2,100			Newly Proposed
346	2079	CHHIPARI	PRECIPITATION	III-6	MW	2,000			Newly Proposed
347	2080	KOLTI	PRECIPITATION	III-6	FW	1,800			Newly Proposed
348	2081	WALUTAR	PRECIPITATION	III-6	MW	1,600			Newly Proposed
349	2082	PATAL	PRECIPITATION	III-6	FW	1,500			Newly Proposed
350	2083	KATTI	PRECIPITATION	III-6	MW	1,400			Newly Proposed
351	2084	DAYARGAU	PRECIPITATION	III-6	MW	1,100			Newly Proposed
352	2085	BINAYAK	PRECIPITATION	III-6	FW	1,100			Newly Proposed
353	2086	PAIMA	PRECIPITATION	III-6	FW	1,000			Newly Proposed
354	2087	SALIBAN	PRECIPITATION	IV	MW	1,500			Newly Proposed
355	2088	GWANTE	PRECIPITATION	IV	MW	600			Newly Proposed
356	2089	KACHILA	PRECIPITATION	IV	MW	600			Newly Proposed
357	2090	JYAMIRE	PRECIPITATION	IV	MW	500			Newly Proposed
358	2091	AMDADA	PRECIPITATION	IX	C	900			Newly Proposed
359	2092	CHURIYA	PRECIPITATION	IX	C	600			Newly Proposed
360	2093	BHIKHANATHOR	PRECIPITATION	IX	C	300			Newly Proposed
361	2094	BAIRIYA	PRECIPITATION	IX	C	200			Newly Proposed
362	2095	BLIOTI	PRECIPITATION	V	MW	400			Newly Proposed
363	2096	PEWA	PRECIPITATION	VI	MW	2,300			Newly Proposed
364	2097	KEURIGAU	PRECIPITATION	VI	MW	1,900			Newly Proposed
365	2098	SIUTBAN	PRECIPITATION	VI	MW	1,900			Newly Proposed
366	2099	GHUSWAN	PRECIPITATION	VI	MW	1,900			Newly Proposed
367	2100	SWARGADWARI	PRECIPITATION	VI	MW	1,700			Newly Proposed
368	2101	AGLUN	PRECIPITATION	VI	W	1,500			Newly Proposed
369	2102	NAMJA	PRECIPITATION	VI	MW	1,500			Newly Proposed
370	2103	CHARTIGAU	PRECIPITATION	VI	MW	1,200			Newly Proposed
371	2104	MASINA	PRECIPITATION	VI	MW	1,100			Newly Proposed
372	2105	DHANCHAUD	PRECIPITATION	VI	C	1,100			Newly Proposed
373	2106	SIRUWARI	PRECIPITATION	VI	MW	1,100			Newly Proposed
374	2107	DHAKABAN	PRECIPITATION	VI	C	1,100			Newly Proposed
375	2108	GASIKOCHHAP	PRECIPITATION	VI	MW	800			Newly Proposed
376	2109	SIDDHARA	PRECIPITATION	VI	C	750			Newly Proposed
377	2110	JURPANI	PRECIPITATION	VI	MW	500			Newly Proposed
378	2111	DHAKERI	PRECIPITATION	VI	MW	400			Newly Proposed
379	2112	PACHAHA	PRECIPITATION	VI	MW	400			Newly Proposed
380	2113	BANKATHI	PRECIPITATION	VI	MW	400			Newly Proposed
381	2114	GANGADHI	PRECIPITATION	VI	MW	300			Newly Proposed
382	2115	BALDENGADHI	PRECIPITATION	VII	W	1,200			Newly Proposed
383	2116	TUKALKADI	PRECIPITATION	VII	W	600			Newly Proposed
384	2117	BHAISAHINAKA	PRECIPITATION	VII	MW	400			Newly Proposed
385	2118	KRISHANAGAR	PRECIPITATION	VII	W	100			Newly Proposed
386	2119	GAJEDI	PRECIPITATION	VII	W	100			Newly Proposed
387	2120	KASERI	PRECIPITATION	VIII-1	C	2,600			Newly Proposed
388	2121	DHARAMPANI	PRECIPITATION	VIII-1	C	600			Newly Proposed
389	2122	RATMATE	PRECIPITATION	VIII-1	C	600			Newly Proposed
390	2123	LAMAGAR	PRECIPITATION	VIII-2	W	4,000			Newly Proposed
391	2124	LIGAU	PRECIPITATION	VIII-2	W	2,700			Newly Proposed
392	2125	SATHIGAU	PRECIPITATION	VIII-2	C	1,900			Newly Proposed
393	2126	LABUBENSI	PRECIPITATION	VIII-2	W	1,200			Newly Proposed
394	2127	DARKHA	PRECIPITATION	VIII-2	C	1,100			Newly Proposed
395	2128	MAIDI	PRECIPITATION	VIII-2	C	1,050			Newly Proposed
396	2129	KARCHE	PRECIPITATION	VIII-3	C	3,100			Newly Proposed
397	2130	BAJE	PRECIPITATION	VIII-3	W	2,200			Newly Proposed
398	2131	HAJHUWAKHAIRENI	PRECIPITATION	VIII-3	W	1,000			Newly Proposed
399	2132	LUITELBHANJYAN	PRECIPITATION	VIII-3	W	800			Newly Proposed
400	2133	JAUBARI	PRECIPITATION	VIII-3	W	700			Newly Proposed
401	2134	KARCHON	PRECIPITATION	VIII-4	W	3,000			Newly Proposed
402	2135	BHUJUN	PRECIPITATION	VIII-4	W	1,600			Newly Proposed
403	2136	CHISANKHU	PRECIPITATION	VIII-4	W	450			Newly Proposed
404	2137	KHUMAKHAN	PRECIPITATION	VIII-5	W	2,200			Newly Proposed
405	2138	SUNPAN	PRECIPITATION	VIII-5	W	1,900			Newly Proposed
406	2139	BHINGITHE	PRECIPITATION	VIII-5	W	1,800			Newly Proposed
407	2140	KHARJYAN	PRECIPITATION	VIII-5	W	1,500			Newly Proposed
408	2141	SHANTIPUR	PRECIPITATION	VIII-5	W	1,200			Newly Proposed
409	2142	KADA	PRECIPITATION	VIII-5	C	1,200			Newly Proposed
410	2143	CHHIPCHHIPE	PRECIPITATION	VIII-3	W	1,100			Newly Proposed
411	2144	BESAREDADA	PRECIPITATION	VIII-5	W	1,050			Newly Proposed
412	2145	ARCHALE	PRECIPITATION	VIII-5	W	1,000			Newly Proposed
413	2146	KATUNJE	PRECIPITATION	VIII-5	C	800			Newly Proposed
414	2147	JYAGDI	PRECIPITATION	VIII-5	W	550			Newly Proposed
415	2148	RAMDI	PRECIPITATION	VIII-5	W	500			Newly Proposed
416	2149	JAMIRE	PRECIPITATION	VIII-5	C	400			Newly Proposed
417	2150	BALARAMPU	PRECIPITATION	VIII-5	C	400			Newly Proposed
418	2151	BHARATPUR	PRECIPITATION	VIII-5	C	200			Newly Proposed
419	2152	MEGHAURI	PRECIPITATION	VIII-5	C	200			Newly Proposed
420	2153	JHIRUDI	PRECIPITATION	VIII-7	W	1,100			Newly Proposed
421	2154	BENIGHAT	PRECIPITATION	VIII-7	C	450			Newly Proposed
422	2155	MUGLIN	PRECIPITATION	VIII-7	C	400			Newly Proposed
423	2156	BENIMANIPUR	PRECIPITATION	VIII-7	W	200			Newly Proposed
424	2157	BALMIKI ASHRAM	PRECIPITATION	VIII-7	C	100			Newly Proposed
425	2158	CHOMARA	PRECIPITATION	VIII-7	W	100			Newly Proposed
426	2159	DHARNE	PRECIPITATION	X	C	1,700			Newly Proposed
427	2160	CHHABELI	PRECIPITATION	X	C	1,600			Newly Proposed
428	2161	KALLMATI	PRECIPITATION	X	C	1,200			Newly Proposed
429	2162	DADHIGURANSE	PRECIPITATION	X	C	550			Newly Proposed
430	2163	JHURJHURE	PRECIPITATION	X	C	400			Newly Proposed
431	2164	RAIGAU	PRECIPITATION	X	C	400			Newly Proposed
432	2165	MATHAULI	PRECIPITATION	X	C	250			Newly Proposed

Table 7.2 LIST OF METEOROLOGICAL STATIONS OF PROPOSED MINIMUM NETWORK (5/5)

NO.	INDEX NO.	NAME OF STATION	TYPE OF STATION	RIVER BASIN	Reg. office	ELE-VATION (m)	TYPE OF RECORDER EXIST	TYPE OF RECORDER PLAN	REMARKS
433	2166	AHALE	PRECIPITATION	XII	C	1,050			Newly Proposed
434	2167	CHHARCHHARE	PRECIPITATION	XII	C	600			Newly Proposed
435	2168	SINDHULIMADI	PRECIPITATION	XII	C	518			Newly Proposed
436	2169	TRIBENIGHAT	PRECIPITATION	XII	E	150			Newly Proposed
437	2170	THANCHHEMU	PRECIPITATION	XIV-2	C	3,200			Newly Proposed
438	2171	NAJIN	PRECIPITATION	XIV-2	E	2,500			Newly Proposed
439	2172	TOMDADA	PRECIPITATION	XIV-2	C	1,300			Newly Proposed
440	2173	BABRE	PRECIPITATION	XIV-2	C	1,200			Newly Proposed
441	2174	CHISAPANI	PRECIPITATION	XIV-2	C	950			Newly Proposed
442	2175	BAKAHKHARKA	PRECIPITATION	XIV-4	E	3,100			Newly Proposed
443	2176	PAHAKHOLA	PRECIPITATION	XIV-4	E	2,900			Newly Proposed
444	2177	CHYAKSILA	PRECIPITATION	XIV-4	E	2,500			Newly Proposed
445	2178	MOYAN	PRECIPITATION	XIV-4	E	2,000			Newly Proposed
446	2179	CHAPE	PRECIPITATION	XIV-4	E	1,400			Newly Proposed
447	2180	BAIKUNTHE	PRECIPITATION	XIV-4	E	1,300			Newly Proposed
448	2181	NOKLUN	PRECIPITATION	XIV-4	E	1,000			Newly Proposed
449	2182	OLANCHUNGOLA	PRECIPITATION	XIV-4	E	3,200			Newly Proposed
450	2183	SAMJIN	PRECIPITATION	XIV-4	E	2,700			Newly Proposed
451	2184	KHEBAN	PRECIPITATION	XIV-4	E	1,900			Newly Proposed
452	2185	SAKRANTI	PRECIPITATION	XIV-4	E	1,900			Newly Proposed
453	2186	ANSARAN	PRECIPITATION	XIV-4	E	1,700			Newly Proposed
454	2187	THARPU	PRECIPITATION	XIV-4	E	1,100			Newly Proposed
455	2188	MAUWAJI	PRECIPITATION	XIV-4	E	550			Newly Proposed
456	2189	RIPAL	PRECIPITATION	XIV-6	E	2,700			Newly Proposed
457	2190	MAHATHAN	PRECIPITATION	XIV-6	C	2,300			Newly Proposed
458	2191	KAPHALE	PRECIPITATION	XIV-6	E	2,100			Newly Proposed
459	2192	CHAHALE	PRECIPITATION	XIV-6	E	2,000			Newly Proposed
460	2193	RISINGO	PRECIPITATION	XIV-6	C	1,800			Newly Proposed
461	2194	SAJKOT	PRECIPITATION	XIV-6	C	1,500			Newly Proposed
462	2195	BIJULIKOT	PRECIPITATION	XIV-6	C	1,100			Newly Proposed
463	2196	MAJHAKHANI	PRECIPITATION	XIV-6	E	800			Newly Proposed
464	2197	SOLPA	PRECIPITATION	XIV-6	C	500			Newly Proposed
465	2198	KAMPUGHAT	PRECIPITATION	XIV-6	E	450			Newly Proposed
466	2199	GAIGHAT	PRECIPITATION	XIV-6	E	152			Newly Proposed
467	2200	SINHADEVI	PRECIPITATION	XV	E	1,400			Newly Proposed
468	2201	YASIMBHE	PRECIPITATION	XV	E	1,050			Newly Proposed
469	2202	GAURIGAN	PRECIPITATION	XV	E	100			Newly Proposed
470	2203	MAHABI	PRECIPITATION	XVI	E	2,050			Newly Proposed
471	SG 1	LANGTANG	Snow & Glacier	VIII-1	C	3,920			Existing
472	SG 2	DINGBOCHE KHUMBU	Snow & Glacier	XIV-3	E	4,355			Existing
473	SG 3	MACHHAPUCHHARE ANNAPURN	Snow & Glacier	VIII-5	W	3,470			Existing
474	SG 4	HURIKOT	Snow & Glacier	III-5	MW	2,735			Existing
475	SG 5	ZANGA, HUMLA	Snow & Glacier	III-1	MW	4,050			Existing
476	SG6	MAKALU	Snow & Glacier	XIV-4	E	3,980			Existing

NOTE TYPE OF RECORDING RAIN GAUGE

WE : Weighing type raingauge
NS : Natural siphone type raingauge
SF : Siphone float type raingauge
TP : Tipping bucket type raingauge
+d : With Data logger

REGION

FW : FAR WESTERN
MW : MID WESTERN
W : WESTERN
C : CENTRAL
E : EASTERN

Table 7.3 SUMMARY OF EXISTING AND PROPOSED RAINGAUGING STATIONS

	Total Raingauging Station			Recording Raingauging Station		
Existing Station	Mountainous Area	194	252	Mountainous Area	33 (10)	46 (14)
	Terai Area	58		Terai Area	13 (4)	
Model Station	Mountainous Area	12	14	Mountainous Area	12	14
	Terai Area	2		Terai Area	2	
Proposed Station	Mountainous Area	196	204	Mountainous Area	0	0
	Terai Area	8		Terai Area	0	
Total	Mountainous Area	402	470	Mountainous Area	45	60
	Terai Area	68		Terai Area	15	

Note: ( ) : Number of Existing Recording Raingauging Station.
Mountainous area is between EL 300 m and EL 4,000 m.
Terai area is below EL 300 m.

Table 7.4 SUMMARY OF EXISTING AND PROPOSED RECORDING RAIN GAUGE

	Existing Recorder			New (Replacement)Recorder				Recording Station
	Type of Recorder	Number of Station		Type of Recorder		Number of Station		
Existing Recording Station	Weighing-type	7 (3)	14 (4)	Replace-ment	Weighing-type	1 (1)	14 (4)	14 Stations
	Tipping bucket-type	0			Tipping bucket-type	13 (3)		
	Siphone-type	7 (1)			Siphone-type	0		
Model Recording Station	Weighing-type	13	14	(no Replacement)				14 Stations
	Tipping bucket-type	1						
	Siphone-type	0						
Proposed Recording Station				Weighing-type		5	32	32 Stations
				Tipping bucket-type		27		
				Siphone-type		0		
Total	Weighing-type	20	28	Weighing-type		6	46	60 Stations
	Tipping bucket-type	1		Tipping bucket-type		40		
	Siphone-type	7		Siphone-type		0		

Note: ( ) Number of instruments to be repaired.

Table 7.5 EXISTING WATER LEVEL GAUGE NETWORK (1/4)

River Basin	Basin Area (sq.km)	Number of Existing Gauge	Existing Gauge No	Drainage Area(sq.km)	Priority Station	Instrument			Start of Record	Ave. Number of Discharge Measurement (per year)	Monthly Dis. Data in Database (years)	Daily W.L Data in Database (year)
I MAHAKALI RIVER	5,317	3	120	1,150					1965	0.3		65-67, 76-78, 84-87
			150			C	R					no data
			169.8	66		C			1985	3.0		85-87
II SOUTHERN BORDER RIVER GROUP NO.1	3,811	2	190.5	313					1985	3.0		85-87
			285	623					1976	1.1		77-83, 85-87, 90
III KARNALI RIVER												
1 HUMLA KARNALI	5,527	2	205	1,310					1978			78-83, 85-87
			206	8,447		C			1979	3.0		79-81, 83, 85-87
2 MUGU KARNALI	6,155	1	208	5,300		C			1979	3.7		78-79, 81, 83-87
3 SINJATILA	3,252	3	220	1,870		C			1964	5.9		77-87
			225	824		C			1964	5.8		77-87
			230	3,470		C			1964	4.3		77-79, 81-87
4 SETI WEST	7,103	4	251	2,040		C				3.0		no data
			255	1,340		C			1978	5.1		78-87
			259.2	4,420		C			1985	4.8		85-87
			260	7,460	P	C	R	S	1963	6.8	23	63-88, 90
5 BHERI	13,867	4	265	6,720		C			1972	7.1		77-87
			267	2,620		C			1976	5.9		77-87
			269.5			C	RP		1991	4.0		no data
			270	12,290	P	C	R	S	1963		23	63-88
6 KARNALI MAIN(OTHERS)	7,323	11	209	795								no data
			210	1,150					1965	1.6		77-78, 85-87
			215	15,200		C			1966			77-87
			240	19,260	P	C	R	S	1961	7.6	24	63, 67-87
			241	1,060		C			1965	4.5		77-79, 86-87
			245	108		C			1978	0.8		78-83, 86-87
			250	21,240	P	C	R		1963	5.7	23	63-88
			262	896	P	C	R		1965	5.1	21	63, 65-67, 69-90
			280	42,890	P	C	R	S	1962	10.9	26	62-88, 90
			287						1980	5.5		no data
			288	14,853					1980	5.0		80-82, 85-87
IV BABAI RIVER	3,252	6	284	295					1977	1.6		77-78, 83-87
			286	816	P	C	R	S	1972	7.8	5	72-86
			289.5			C			1977	1.5		85-86
			289.9			C						67-74, 77-87
			289.95			C	R			4.0		no data
			291									no data
V SOUTHERN BORDER RIVER GROUP NO.2	948	0										

Table 7.5 EXISTING WATER LEVEL GAUGE NETWORK (2/4)

River Basin	Basin Area (sq.km)	Number of Existing Gauge	Existing Gauge No	Drainage Area(sq.km)	Priority Station	Instrument			Start of Record	Ave. Number of Discharge Measurement (per year)	Monthly Dis. Data in Database (years)	Daily W.L. Data in Database (year)
VI RAPTI(WEST) RIVER	6,215	8	327	467		C			1976	4.5		77-80, 85-86
			330	1,980	P	C			1964	7.0	22	65-88
			333	136		C			1968	6.6		77-87
			339.5	683	P	C			1971	7.5	14	71-88
			350	3,380	P	C	R	S	1975	9.7	10	75-88
			350.5	92		C			1983	5.6		85-87
			360	5,150	P	C	R	S	1964	9.7	22	64-85
			385.2							1.0		no data
VII SOUTHERN BORDER RIVER GROUP NO.3	4,849	4	387.4	90		C			1980			80-86
			387.5	103		C	R		1980			80-86
			387.8	99		C			1985			86-87
			390	554	P	C			1963		6	71-86
VIII NARAYANI/GANDAKI RIVER												
1 TRISULI	3,622	7	446.2	540		C			1977			78-86
			446.3	49		C	R		1963	1.4		69-86
			446.8	162	P				1969	3.9	15	71-89
			447	4,110	P	C	R	S	1967	4.6	19	77-90
			447.4	254					1977	2.2		77, 86
			447.9	145					1976	2.0		76-86
			448	653	P				1968	2.5	17	69-89
2 BUDHI	3,621	2	445	4,270	P	C	R	S	1963		22	64-87
			445.3	768		C			1967			77-80, 82-86
3 MARSYANGDI	4,819	5	439.3	151		C			1981			81-87
			439.4	341		C			1976			84-86
			439.7	4,088	P	C	R	S	1987			no data
			440	308	P	C	RP		1963		22	64-86
			441	386		C			1967			77-82, 84-86
4 SETI GANDAKI	2,843	3	428	160		C			1970			77-82, 85-87
			430	582	P	C			1964		20	64-85
			438	858		C			1973			76-83, 85-87
5 KALI GANDAKI	11,573	12	403	3,060					1969			77-82, 85-87
			404.6	4,581					1971			77-78, 85-89
			404.7	1,112		C			1975			77-78, 81, 85-89
			406.5	635		C			1975			76-80, 84-86
			409.5	138					1976			78, 81, 85-86
			410	6,630	P	C	R	S	1964		22	64-84, 89
			413.2			C						no data
			415	476	P	C			1964		22	64-89
			416.2	239					1978			84-86
			417	1,990		C			1967			77-82, 84-87
			419.1			C			1989			no data
			420	11,400	P	C	R		1964	1.5	21	64-90

Table 7.5 EXISTING WATER LEVEL GAUGE NETWORK (3/4)

River Basin	Basin Area (sq.km)	Number of Existing Gauge	Existing Gauge No	Drainage Area(sq.km)	Priority Station	Instrument			Start of Record	Ave. Number of Discharge Measurement (per year)	Monthly Dis. Data in Database (years)	Daily W.L. Data in Database (year)
6 RAPTI(GANDAKI)	2,993	3	460	579	P	C			1963	2.5	23	63-89
			465	427	P	C	R		1963	2.1	23	63-87
			470	169	P	C			1963	2.5	22	64-88
7 NARAYANI/GANDAKI MAIN(OTHERS)	2,255	3	449.9							1.3		no data
			449.95	14,500		C			1982	0.0		82-85
			450	31,100	P	C	R	S	1962	2.6	24	63-89
IX SOUTHERN BORDER RIVER GROUP NO.4	3,502	0										
X BAGMATI RIVER	3,681	12	505	17	P	C	R		1962	3.2	23	63-87, 89-90
			507	13					1963	0.0		77-87
			510	3					1963	0.4		77-85
			511							0.7		no data
			525.5							0.0		no data
			530	68					1964	0.2		64-73, 77-86
			536.2	4	P				1968	1.7	17	69-85
			548	56					1962	0.0		no data
			550.05				RP		1991	0.0		no data
			586						1989	0.0		no data
			589	2,700	P	C	R	S	1979	3.7	7	79-86
			592	13,790					1983	3.7		83-84
XI SOUTHERN BORDER RIVER GROUP NO.5	3,013	0										
XII KAMALA RIVER	1,786	2	598	1,595			G		1985	0.9		no data
			599						1985	1.8		83-84
XIII SOUTHERN BORDER RIVER GROUP NO.6	1,896	0										
XIV SUN KOSHI/SAPTA KOSHI RIVER												
1 BHOTE KOSHI	240	1	610	2,410	P	Br			1965	1.3	20	65-90
2 TAMA KOSHI	2,714	2	647	2,753	P	C	R		1970	3.9	16	71-87
			650	313	P	C			1964	3.3		64-86
3 DUDH KOSHI	4,030	3	668.4	87		Br			1976	1.6		86-87
			668.5	324		Br			1976	3.3		86
			670	4,100	P	C	R	S	1964	4.1	22	64-88
4 ARUN	5,248	9	600.05	352					1986	0.0		no data
			600.1	26,750	P	C	R	S	1972	2.7		72-83, 85-88
			601.8	26					1983	2.1		85-86
			601.9	38					1983	1.9		85-86
			602	375		C	R		1974	6.7		74-87
			602.5	110		C			1975	7.6		72-76, 78-79, 84-87
			604	4,183					1968	0.0		78, 85-87
			604.5	28,200	P	C	R		1975	5.2	11	75-88
			606	5,173		Br			1980	2.3		86

Table 7.5 EXISTING WATER LEVEL GAUGE NETWORK (4/4)

River Basin	Basin Area (sq.km)	Number of Existing Gauge	Existing Gauge No	Drainage Area(sq.km)	Priority Station	Instrument			Start of Record	Ave. Number of Discharge Measurement (per year)	Monthly Dis. Data in Database (years)	Daily W.L. Data in Database (year)
5 TAMUR/TAMAR	6,125	5	684	4,076		C			1982	3.8		85-87
			688.7	28					1983	5.4		86-87
			689	51					1964	4.8		86
			690	5,640	P	Br	RP	S	1965	5.3	22	65-87
			691	6,146		C			1981	2.4		86-87
6 SUN KOSHI MAIN(OTHERS)	9,506	14	612	84					1989	1.0		no data
			620	629	P	C			1963	2.8	24	64-90
			625	1,375		C			1980	1.8		80-87
			627.5							6.0		78-80
			629.1	1,225		C			1977	2.6		77-87
			630	4,920	P	C	G		1964	3.0	23	64-90
			640	87	P				1963	1.4	21	64-87
			641							0.0		no data
			652	10,000	P	C			1967	1.8	15	67-90
			660	823	P	C			1964	1.3	21	64-90
			665	8,736		C	R		1986	2.3		86-87
			680	17,600	P				1965	0.3	20	65-87
			681	14,682		C			1976	0.0		86-87
			695	54,100	P	C	G	S	1977	3.1	11	77-88
XV SOUTHERN BORDER RIVER GROUP NO.7	3,462	0										
XVI KANKAI RIVER	1,317	5	728	377	P	C	R	S	1983	3.1	4	83-87
			730	107	P	C			1965	3.7	4	65-87
			738	199		C			1982	1.6		86-87
			795	1,148	P	C	R		1971	3.8	13	71-87
			799	1,330					1987	5.4		no data
XVII SOUTHERN BORDER RIVER GROUP NO.8	1,316	0										
TOTAL	147,181	136			46							

NOTES:
- C; Cableway
- Br; Bridge
- R; Recorder for float type
- RP; Recorder for Pressure type
- G; Gauge well only without recorder
- S; Sediment sampler

Table 7.6 MINIMUM WATER LEVEL GAUGE NETWORK (1/5)

River Basin	Basin Area (sq.km)	Basin Area below EL.4000 (sq.km)	Number of Existing Gauge	Recommended Number of Gauge	Existing Gauge No	Model System	Newly Proposed Gauge to be Added	Hydrological Aspect						Water Usage/Control Aspect						Proposed Minimum Network
								(1-1) Near Border	(1-2) Conf. of Tributary	(1-3) Topo. Change	(1-4) High-Land	(1-5) Fault Zone	(1-6) Rainfall Change	(2-1) Hydro Power	(2-2) Irri-gation	(2-3) Water Supply	(2-4) Flood Control	(2-5) Glacial Lake	(2-6) Soil Con-servation	
I MAHAKALI RIVER	5,317	4,360	3	4	120				#											#
					150				#					#						#
					169.8															
							New 1		#											#
							New 2			#		#			#					#
							New 3	#									#			#
II SOUTHERN BORDER RIVER GROUP NO.1	3,811	3,810	2	2	190.5															
					285			#							#		#			#
III KARNALI RIVER																				
1 HUMLA KARNALI	5,527	1,600	2	2	205						#							#		#
					206				#											#
2 MUGU KARNALI	6,155	1,480	1	1	208				#											#
							New 4				#							#	#	#
3 SINJATILA	3,252	2,570	3	3	220				#					#						#
					225				#											#
					230				#					#						#
4 SETI WEST	7,103	5,820	4	6	251				#		#		#					#		#
					255				#							#				#
					259.2				#				#	#						#
					260(P)				#			#								#
							New 5		#											#
5 BHERI	13,867	9,290	4	9	265				#											#
					267				#										#	#
					269.5							#		#	#					#
					270(P)				#					#					#	#
							New 6				#	#						#		#
							New 7		#			#	#						#	#
							New 8		#				#	#						#
6 KARNALI MAIN(OTHERS)	7,323	6,960	11	7	209				#			#								#
					210															
					215				#					#						#
					240(P)									#						#
					241				#							#			#	#
					245															
					250(P)				#			#								#
					262(P)				#			#								#
					280(P)					#				#	#					#
					287			#							#		#			#
					288			#							#		#			#

Table 7.6 MINIMUM WATER LEVEL GAUGE NETWORK (2/5)

River Basin	Basin Area (sq.km)	Basin Area below EL.4000 (sq.km)	Number of Existing Gauge	Recommended Number of Gauge	Existing Gauge No	Model System	Newly Proposed Gauge to be Added	Hydrological Aspect						Water Usage/Control Aspect						Proposed Minimum Network
								(1-1) Near Border	(1-2) Conf. of Tributary	(1-3) Topo. Change	(1-4) High-Land	(1-5) Fault Zone	(1-6) Rainfall Change	(2-1) Hydro Power	(2-2) Irri-gation	(2-3) Water Supply	(2-4) Flood Control	(2-5) Glacial Lake	(2-6) Soil Con-servation	
IV BABAI RIVER	3,252	3,250	6	3	284															
					286(P)				#			#								#
					289.5															
					289.9				#					#		#			#	#
					289.95				#	#					#					#
					291			#							#		#			#
V SOUTHERN BORDER RIVER GROUP NO.2	948	950	0	0			New 9	#							#		#			#
VI RAPTI(WEST) RIVER	6,215	6,220	8	6	327															
					330(P)				#			#								#
					333															
					339.5(P)				#			#		#						#
					350(P)				#			#			#				#	#
					350.5															
					360(P)					#				#	#				#	#
					385.2			#							#		#			#
VII SOUTHERN BORDER RIVER GROUP NO.3	4,849	4,850	4	3	387.4															
					387.5				#			#				#	#			#
					387.8															
					390(P)				#	#			#		#	#	#		#	#
VIII NARAYANI/GANDAKI RIVER																				
1 TRISULI	3,622	2,900	7	3	446.2									#						
					446.3															
					446.8(P)				#											#
					447(P)				#										#	#
					447.4															
					447.9															
					448(P)				#											#
2 BUDHI	3,621	2,300	2	2	445(P)				#				#	#					#	#
					445.3				#					#					#	#
							New 10				#		#	#				#		#
3 MARSYANGDI	4,819	2,680	5	3	439.3															
					439.4															
					439.7(P)				#				#	#					#	#
					440(P)				#											#
					441															
							New 11				#		#	#				#	#	#
4 SETI GANDAKI	2,843	2,620	3	3	428															
					430(P)				#				#			#				#
					438				#				#	#						#
							New 12		#					#					#	#

Table 7.6 MINIMUM WATER LEVEL GAUGE NETWORK (3/5)

River Basin	Basin Area (sq.km)	Basin Area below EL.4000 (sq.km)	Number of Existing Gauge	Recommended Number of Gauge	Existing Gauge No	Model System	Newly Proposed Gauge to be Added	Hydrological Aspect						Water Usage/Control Aspect						Proposed Minimum Network
								(1-1) Near Border	(1-2) Conf. of Tributary	(1-3) Topo. Change	(1-4) High-Land	(1-5) Fault Zone	(1-6) Rainfall Change	(2-1) Hydro Power	(2-2) Irrigation	(2-3) Water Supply	(2-4) Flood Control	(2-5) Glacial Lake	(2-6) Soil Conservation	
5 KALI GANDAKI	11,573	8,330	12	8	403						#			#				#		#
					404.6															
					404.7				#											#
					406.5				#				#							#
					409.5															
					410(P)	(improved)			#					#					#	#
					413.2															
					415(P)				#					#						#
					416.2															
					417				#				#						#	#
					419.1									#						#
					420(P)				#			#		#					#	#
						Tatopani						#	#	#					#	#
						Kalleri			#										#	#
6 RAPTI(GANDAKI)	2,993	2,990	3	3	460(P)				#	#				#	#	#				#
					465(P)				#	#		#								#
					470(P)				#	#		#				#				#
7 NARAYANI/GANDAKI MAIN(OTHERS)	2,255	2,260	3	2	449.9				#					#					#	#
					449.95															
					450(P)					#		#		#						#
							New 13	#									#			#
IX SOUTHERN BORDER RIVER GROUP NO.4	3,502	3,500	0	2		Chyuntaha		#							#		#			#
X BAGMATI RIVER	3,681	3,680	12	3	505(P)				#							#				#
					507															
					510															
					511															
					525.5															
					530															
					536.2(P)															
					548															
					550.05				#				#						#	#
					586															
					589(P)					#			#	#	#				#	#
					592			#									#			#
XI SOUTHERN BORDER RIVER GROUP NO.5	3,013	3,010	0	1			New 14	#									#			#
XII KAMALA RIVER	1,786	1,790	2	1	598					#				#	#					#
					599			#									#			#
XIII SOUTHERN BORDER RIVER GROUP NO.6	1,696	1,900	0	1			New 15	#									#			#

Table 7.6 MINIMUM WATER LEVEL GAUGE NETWORK (4/5)

River Basin	Basin Area (sq.km)	Basin Area below EL.4000 (sq.km)	Number of Existing Gauge	Recommended Number of Gauge	Existing Gauge No	Model System	Newly Proposed Gauge to be Added	Hydrological Aspect						Water Usage/Control Aspect						Proposed Minimum Network
								(1-1) Near Border	(1-2) Conf. of Tributary	(1-3) Topo. Change	(1-4) High-Land	(1-5) Fault Zone	(1-6) Rainfall Change	(2-1) Hydro Power	(2-2) Irrigation	(2-3) Water Supply	(2-4) Flood Control	(2-5) Glacial Lake	(2-6) Soil Conservation	
XIV SUN KOSHI/SAPTA KOSHI RIVER																				
1 BHOTE KOSHI	240	220	1	0	610(P)				#			#	#	#						#
2 TAMA KOSHI	2,714	2,060	2	2	647(P)				#					#						#
					650(P)				#					#						#
3 DUDH KOSHI	4,030	2,300	3	2	668.4															
					668.5															
					670(P)				#			#		#					#	#
							New 16		#		#							#		#
4 ARUN	5,248	4,330	9	4	600.05															
					600.1(P)									#						#
					601.8															
					601.9															
					602															
					602.5															
					604									#						#
					604.5(P)				#				#	#						#
					606				#					#						#
5 TAMUR/TAMAR	6,125	4,350	5	4	684				#				#	#						#
					688.7															
					689															
					690(P)				#					#					#	#
					691															
							New 17				#		#					#		#
							New 18		#											#
6 SUN KOSHI MAIN(OTHERS)	9,506	8,940	14	8	612															
					620(P)							#	#							#
					625															
					627.5															
					629.1				#											#
					630(P)				#				#	#					#	#
					640(P)															
					641															
					652(P)				#					#	#				#	#
					660(P)				#			#							#	#
					665				#					#					#	#
					680(P)				#										#	#
					681															
					695(P)					#		#		#						#
							New 19	#									#			#

Table 7.6 MINIMUM WATER LEVEL GAUGE NETWORK (5/5)

River Basin	Basin Area (sq.km)	Basin Area below EL.4000 (sq.km)	Number of Existing Gauge	Recommended Number of Gauge *	Existing Gauge No	Model System	Newly Proposed Gauge to be Added	Hydrological Aspect						Water Usage/Control Aspect						Proposed Minimum Network
								(1-1) Near Border	(1-2) Conf. of Tributary	(1-3) Topo. Change	(1-4) High-Land	(1-5) Fault Zone	(1-6) Rainfall Change	(2-1) Hydro Power	(2-2) Irrigation	(2-3) Water Supply	(2-4) Flood Control	(2-5) Glacial Lake	(2-6) Soil Conservation	
XV SOUTHERN BORDER RIVER GROUP NO.7	3,462	3,460	0	2			New 20	#							#	#	#			#
XVI KANKAI RIVER	1,317	1,320	5	1	728(P)				#							#				#
					730(P)				#											
					736															
					795(P)					#				#	#					#
					799			#									#			#
XVII SOUTHERN BORDER RIVER GROUP NO.8	1,316	1,320	0	1			New 21	#							#		#			#
TOTAL	147,181	117,420	136	102	136	4	21													110

NOTES:

*: Recommended Number of Gauge=(Mountain area/1000sq.km)+(Teral area/2500sq.km)
Here,1000sq.km/gauge and 2500sq.km/gauge are the WMO norm.

(P); Present Priority Station

Model System; Mod 1 : Tatopani
Mod 2 : Kaileri
Mod 3 : Chyuntaha

Table 7.7 LIST OF HYDROMETRIC STATIONS OF PROPOSED MINIMUM NETWORK (1/3)

NO.	INDEX NUMBER	NAME OF RIVER	NAME OF SITES	TYPE OF STATION	NUMBER OF BASIN	RE-GION	BASIN AREA(sq.km) inside Nepal	include outside	PHY. DIV.	EXISTING INSTRUMENT			PROPOSED INSTRUMENT				REMARKS
1	120	CHAMELIA	KARKALE GAON		I	FW	1,150		MM				S	P+d			Existing
2	150	MAHAKALI	PANCHESHWOR	BASIC	I	FW	12,600		MM	S	F		DW	F+d	PS	WQ	Existing
3	285	MOHANA	KALAKUNTA		II	FW	623		S				S				Existing
4	205	KHARPU KHOLA	KHARPU	P	III-1	MW	1,310		HM				DW	P+d			Existing
5	206	HUMLA KARNALI	BIHI CHHARA	P	III-1	MW	5,471	8,447	HM				DW	P+d			Existing
6	208	MUGU KARNALI	SURKHET	P	III-2	MW	5,300		HM	S++			DW	P+d			Existing
7	220	TILA NALA	NAGINA		III-3	MW	1,870		HM	S++			S				Existing
8	225	SINJA KHOLA	DIWARE		III-3	MW	824		HM	S++			S				Existing
9	230	TILA NADI	SETIGHAT	P	III-3	MW	3,470		HM	S++			DW	P+d			Existing
10	251	SETI	CHAINPUR		III-4	FW	2,040		HM	S++			S				Existing
11	255	BHDHI GANGA	KAKARSANT		III-4	FW	1,340		MM	S++			S				Existing
12	259.2	SETI	GOPAGHAT GAON		III-4	FW	4,420		MM	S			(S)				Existing
13	260	SETI	BANGA NEAR BELGAON	P	III-4	FW	7,460		MM	S++	F	DS	DW	F+d			Existing
14	265	THULO BHERI	RIMNA	P	III-5	MW	6,720		HM	S++			DW	P+d			Existing
15	267	SANO BHERI	SIMLI GHAT		III-5	MW	2,620		HM	S++			S				Existing
16	269.50	BHERI NADI	SAMAIJI GHAR	P	III-5	MW	9,670		S	S++	F		S	F+d			Existing
17	270	BHERI	JAMU	P	III-5	MW	12,290		S	S++	F	DS	S	P+d	DS		Existing
18	209	KAWADI KHOLA	KAWADI GHAT		III-6	MW	795		HM				S				Existing
19	215	HUMLA KARNALI	THULDADA	P	III-6	MW	15,200		HM	S++			DW	P+d			Existing
20	240	KARNALI	ASARA GHAT	P	III-6	FW	19,260		MM	S++	F	DS	DW	F+d	(DS)		Existing
21	241	LOHARE KHOLA	TALLO DUNGESWAT		III-6	MW	1,060		MM	S++			S				Existing
22	250	KARNALI	BENIGHAT	P	III-6	FW	21,240		MM	S++	F		DW	F+d			Existing
23	262	TULI GAD	KHANAYATAL		III-6	FW	896		S	S++	F		S	F+d			Existing
24	280	KARNALI	CHISAPANI	BASIC	III-6	FW	42,890		S	DW	F	PS	DW	F+d	(PS)	WQ	Existing
25	287	KAURIALA KARNALI	SATTAR FARM		III-6	MW	43,650		T				----	----			Existing
26	288	GERUWA KARNALI	KOTHIYA GHAT		III-6	MW	43,650		T				----	----			Existing
27	286	SARADA KHOLA	DARADHUNGA		IV	MW	816		S	S++	F-	DS	S				Existing
28	289.9	BABAI NADI	GANGATA		IV	MW	1,320		S				----	----			Existing
29	289.95	BABAI NADI	CHEPANG	BASIC	IV	MW	3,000		S	S++	F		DW	F+d	PS	WQ	Existing
30	291	BABAI NADI	BHADA		IV	MW	3,097		T				S				Existing
31	330	MARI LHOLA	NAYAGAON		VI	MW	1,980		MM	S++			S				Existing
32	339.5	JHIMRUK KHOLA	TIGRA GAON		VI	MW	683		MM	S++	F		S				Existing
33	350	RAPTI	BAGASOTI GAON	BASIC	VI	MW	3,380		S	S++	F-	DS	DW	P+d	PS	WQ	Existing
34	360	RAPRI	JALKUNDI	P	VI	MW	5,150		S	S++	F	DS	S	P+d			Existing
35	385.2	RAPTI RIVER	FARINDA		VI	MW	6,120		T				----	----			Existing
36	387.5	MADI TINAU	CHARCHARE		VII	W	103		S	S	F		(S)	F+d			Existing
37	390	TINAU KHOLA	BUTWAL	BASIC	VII	W	554		S	S++			DW	P+d	PS	WQ	Existing
38	446.8	PHALANKHU KHOLA	BETRAWATI		VIII-1	C	162		MM				S				Existing
39	447	TRISULI	BETRAWATI	P	VIII-1	C	4,110		MM	S	F++	DS	DW	P+d	(DS)		Existing
40	448	TADI KHOLA	TADIPUL BELKOT		VIII-1	C	653		MM	Br			S				Existing
41	445	BURHI GANDAKI	ARUGHAT	P	VIII-2	W	4,270		MM	S	F++	DS	DW	P+d	(DS)		Existing
42	445.3	ANKHU KHOLA	ANKHU BRIDGE		VIII-2	W	768		MM	S++			S				Existing
43	439.7	MARSYANGDI	BIMAL NAGAR	P	VIII-3	W	4,088		MM	S	F	DS	DW	F+d	(DS)		Existing

Table 7.7 LIST OF HYDROMETRIC STATIONS OF PROPOSED MINIMUM NETWORK (2/3)

NO.	INDEX NUMBER	NAME OF RIVER	NAME OF SITES	TYPE OF STATION	NUMBER OF BASIN	RE-GION	BASIN AREA(sq.km) inside Nepal	include outside	PHY. DIV.	EXISTING INSTRUMENT			PROPOSED INSTRUMENT				REMARKS
44	440	CHEPE KHOLA	GARAM BESI		VIII-3	W	308		MM	S	P		(S)	P+d			Existing
45	430	SETI	PHOOLBARI		VIII-4	W	582		MM	S++			S	P+d			Existing
46	438	MADI	SHISA GHAT		VIII-4	W	858		MM	S			(S)				Existing
47	403	KALI GANDAKI	JOMSOM		VIII-5	W	3,060		HH				S				Existing
48	404.7	MYAGDI KHOLA	MANGLA GHAT		VIII-5	W	1,112		HM	S			(S)				Existing
49	406.5	MODI KHOLA	NAYAPUL NEAR JHAPRE BAGAR		VIII-5	W	635		MM	S			(S)				Existing
50	410	KALI GANDAKI	SETI BENI	P	VIII-5	W	6,630		MM	S	F&P	DS	DW	(P)+d	(DS)		Existing
51	415	ANDHI KHOLA	DUMRICHAUR ANDHIMUHAN	P	VIII-5	W	476		MM	S+			DW	P+d			Existing
52	417	BADIGAD KHOLA	RUDRABENI GULMI		VIII-5	W	1,990		MM	S			(S)				Existing
53	419.1	KALI GANDAKI	ANSIGH - ANDHI GHAT		VIII-5	W	10,220		MM	S			(S)				Existing
54	420	KALI GANDAKI	KOTAGAON SHRINGE	P	VIII-5	C	11,400		S	S	F+		(S)	P+d			Existing
55	460	RAPTI	RAJAIYA	P	VIII-6	C	579		S	S+			S	P+d			Existing
56	465	MANAHARI KHOLA	MANAHARI		VIII-6	C	427		S	S+	F		S	F+d			Existing
57	470	LOTHAR KHOLA	LOTHAR		VIII-6	C	169		S	S			(S)				Existing
58	449.9	TRISULI	MUGLING		VIII-7	C	7,648	11,720	MM				S				Existing
59	450	NARAYANI	NARAYAN GHAT	BASIC	VIII-7	C	27,030	31,100	S	S	F	DS	DW	F+d	PS	WQ	Existing
60	505	BAGMATI	SUNDARIJAL		X	C	17		MM	S+	F		S	F+d			Existing
61	550.05	BAGMATI	KHOKANA	P	X	C	610		MM	Br	P		DW	P+d		WQ	Existing
62	589	BAGMATI	PANDHERA DOBHAN	BASIC	X	C	2,700		T	S	F+	DS	DW	P+d	PS	WQ	Existing
63	592	BAGMATI	BRAMHAPURI		X	C	3,790		T				----	----			Existing
64	598	KAMALA	CHISAPANI	BASIC	XII	E	1,595		S				DW	P+d	PS	WQ	Existing
65	599	KAMALA	INARWA		XII	E	1,775		T				----	----			Existing
66	610	BHOTE KOSI	BARABISE	P	XIV-1	C	240	2,410	HM	Br			DW	P+d			Existing
67	647	TAMAKOSI	BUSTI	P	XIV-2	C	1,896	2,753	MM	S	F++		DW	P+d			Existing
68	650	KHIMTI KHOLA	RASNALU VILLAGE		XIV-2	C	313		MM	S+			S				Existing
69	670	DUDH KOSI	RABUWA BAZAR	P	XIV-3	E	4,100		MM	S	F	DS	DW	F+d	DS		Existing
70	600.1	ARUN	UWA GAON	P	XIV-4	E	1,204	26,750	HM	S	F	DS	DW	P+d	(DS)		Existing
71	604	ARUN	LEGUWA GHAT		XIV-4	E	4,183		MM				S				Existing
72	604.5	ARUN	TURKEGHAT	P	XIV-4	E	2,707	28,200	MM	S	F+		DW	P+d			Existing
73	606	ARUN	SIMLE	P	XIV-4	E	5,173		MM	Br			DW	P+d			Existing
74	684	TAMUR	MAJHITAR		XIV-5	E	4,076		MM	S			(S)				Existing
75	690	TAMUR	MULGHAT	P	XIV-5	E	5,640		MM	Br	P	DS	S	(P)+d	(DS)		Existing
76	620	BALEPHI KHOLA	JALBIRE		XIV-6	C	629		MM	S			(S)				Existing
77	629.1	INDRAWATI	DOLAL GHAT	P	XIV-6	C	1,225		MM	S			DW	P+d			Existing
78	630	SUN KOSI	PACHUWAR GHAT	P	XIV-6	C	4,920		MM	S			DW	P+d			Existing
79	652	SUNKOSI	KHURKOT		XIV-6	C	7,840	10,000	MM	S			(S)				Existing
80	660	LIKHU KHOLA	SANGUTAR		XIV-6	C	823		MM	S	F		(S)	F+d			Existing
81	665	SUN KOSI	AHRKAPUR (TOKSELGHAT)	P	XIV-6	E	8,736		MM	S	F		DW	P+d			Existing
82	680	SUN KOSHI	KAMPUGHAT	P	XIV-6	E	14,583	17,600	MM				DW	P+d	DS		Existing
83	695	SAPTA KOSHI	CHATARA-KOTHU	BASIC	XIV-6	E	24,400	54,100	S	S	F	DS	DW	F+d	PS	WQ	Existing
84	728	MAI KHOLA	RAJDWAIL		XVI	E	377		MM	S	F+	DS	(S)				Existing
85	795	KANKAI MAI	MAINACHULI	BASIC	XVI	E	1,148		S	S+	F+		DW	P+d	PS	WQ	Existing
86	799	KANKAI	KUMARKHOD - JHAPA		XVI	E	1,330		T				----	----			Existing

Table 7.7 LIST OF HYDROMETRIC STATIONS OF PROPOSED MINIMUM NETWORK (3/3)

NO.	INDEX NUMBER	NAME OF RIVER	NAME OF SITES	TYPE OF STATION	NUMBER OF BASIN	RE-GION	BASIN AREA(sq.km) inside Nepal	include outside	PHY. DIV.	EXISTING INSTRUMENT		PROPOSED INSTRUMENT		REMARKS
87	403.5	KALI GANDAKI	TATOPANI	P	VIII-5	W	3,690		HM	DB	P	DW	(P)+d	Model system
88	406	KALI GANDAKI	KALLERI	P	VIII-5	W	5,600		MM	DB	P+d	DW	(P+d)	Model system
89	595	JAMUNI RIVER	CHYUNTAHA	P	IX	C	110		T	DB	F	DW	(F)	Model system
90	New 1	SURMAYA GAD	MELGHAT		I	FW	750		MM			S		Proposed
91	New 2	MAHAKALI	BRAMHADEBMANDI	P	I	FW	14,600		S			S	P+d	Proposed
92	New 3	MAHAKALI	DODHARA		I	FW	15,200		T			----	----	Proposed
93	New 4	MUGU-KARNALI	DABRA		III-2	MW	4,280		HH			S		Proposed
94	New 5	SETI	SUNKADA or RAYAL		III-4	FW	560		MM			S		Proposed
95	New 6	THULI-BHERI	JUPHAL		III-5	MW	2,925		HM			S		Proposed
96	New 7	THULI-BHERI	SHIMI		III-5	MW	3,920		HM			S		Proposed
97	New 8	BHERI	RATOCHAUR		III-5	MW	8,400		MM			S		Proposed
98	New 9	MAN RIVER	BALAIPUR		V	MW	948		T			S		Proposed
99	New10	BUDHI-GANDARI	LUKUWA	P	VIII-2	W	1,605		HM			DB	P+d	Proposed
100	New11	MARSYANDI	BAJE		VIII-3	W	2,005		HM			S		Proposed
101	New12	SETI	KALIKATAR	P	VIII-4	W	2,812		MM			DB	P+d	Proposed
102	New13	NARAYANI	SUSTA		VIII-7	W	31,719		T			S		Proposed
103	New14	RATO RIVER	SAKRI		XI	C	385		T			S		Proposed
104	New15	BHATIWALAN RIVER	MADHUPATTI ?		XIII	E	420		T			S		Proposed
105	New16	DUDH KOSHI	JUBIN		XIV-3	E	1,565		HM			S		Proposed
106	New17	TAMAR	TAPLETHOK		XIV-5	E	1,815		HM			S		Proposed
107	New18	KABELI-KHOLA	ANBUN		XIV-5	E	850		MM			S		Proposed
108	New19	SAPTA KOSHI	BALUWA		XIV-6	E	27,860		T			----	----	Proposed
109	New20	BUDHI RIVER	AMAHI		XV	E	410		T			S		Proposed
110	New21	MECHI	BANIYANI	P	XVII	E	782		T			S	P+d	Proposed
111	SG 1		LANGTANG		VIII-1	C	340		HH					Snow & Glacier
112	SG 2		DINGBOCHE KHUMBU		XIV-3	E	135		HH					Snow & Glacier
113	SG 3		MACHHAPUCHHRE ANNAPURNA		VIII-5	W	148		HH					Snow & Glacier
114	SG 4		HURIKOT		III-5	MW	725		HH					Snow & Glacier
115	SG 5		ZANGA, HUMLA		III-1	MW	553		HH					Snow & Glacier
116	SG 6		MAKALU		XIV-4	E	240		HH					Snow & Glacier

NOTE: INSSTRUMENT

DW: Double drum winch Cable way (Bank operating)

S : Single drum winch Cable way with Cable car

Br: Bridge

F : Float-type Recording water level gauge

P : Pressure-type Recording water level gauge

+t: With Telemetry Capability

+d: With Data Logger

PS: Point Integrated Sediment Sampler

DS: Depth Integrated Sediment Sampler

WQ: Water Quality Sampling Instrument

+ : Repair is to be required

++: Replacement is to be required

( ): New installation is not necessary

REGION

FW: FAR WESTERN

MW: MID WESTERN

W : WESTERN

C : CENTRAL

E : EASTERN

Type of station

BASIC: Bacic station

P : Primary station

Others are Secondary station

PHY. DIV. : Physiographic Division

HH : High Himalaya

HM : High Mountain

MM : Middle Mountain

S : Siwalik

T : Terai

Table 7.8 SUMMARY OF INSTRUMENTS OF EXISTING AND PROPOSED WATER LEVEL GAUGING STATION

	Type of Station	Number of Station		Instrument to be installed													
				Cable Way				Water Level Recorder				Sediment Observation				W.Q. Obs	
				DW	S	Sub total		P	F	Sub total		PS	DS	Subtotal		Sub total	
Existing Station	Basic	10	86	10	0	10	79	3	7	10	41	10	0	10	20	10	11
	Primary	31		25	6	31		8	23	31		0	10	10		1	
	Secondary	45		0	38	38		0	0	0		0	0	0		0	
Model Station	Basic	0	3	0	0	0	3	0	0	0	3	0	0	0	0	0	0
	Primary	3		3	0	3		2	1	3		0	0	0		0	
	Secondary	0		0	0	0		0	0	0		0	0	0		0	
Proposed Station	Basic	0	21	0	0	0	18	0	0	0	4	0	0	0	0	0	0
	Primary	4		2	1	3		2	2	4		0	0	0		0	
	Secondary	17		0	15	15		0	0	0		0	0	0		0	
Total	Basic	10	110	10	0	10	100	3	7	10	48	10	0	10	20	10	11
	Primary	38		30	7	37		12	26	38		0	10	10		1	
	Secondary	62		0	53	53		0	0	0		0	0	0		0	
	Total			40	60	100		15	33	48		10	10	20		11	

Note: Cable way

- DW : Double drum winch
- S : Single drum winch

Water level Recorder

- P : Pressure-type
- F : Float-type

Sediment observation

- PS : Point integrated Sampler
- DS : Depth integrated Sampler

W.Q. Obs : Water Quality observation

Table 7.9 RECOMMENDED FIELD SCHEDULE ON PRECIPITATION STATIONS

Month		Recording Station			Non-Recording Station		Specified Station
		Inspection		Data Collect	Insp.	Data Collect	Annual inspect.
		F.Te	M.Te		F.Te		Me
Jan.							
Feb.		○		○	○	△	
Mar.							
Apr.			(Cal)				◎
May		△		○			
June	Mon soon		Stand by at office	(Manual data to be sent by mail once a month)		(Manual data to be sent by mail once a month)	
July							
Aug.		△		○			
Sep.							
Oct.							
Nov.		○		○			
Dec.			○				
Total Number		2	2	4	1		1

Remarks

F.Te : Field technician
M.Te : Mechanical technician
Me : Meteorologist
○ : as scheduled
△ : as required
(Cal) : Calibration and adjustment of instruments

1) Annual inspection by Meteorologist shall be carried out according to results of field inspection by technicians.

Table 7.10 RECOMMENDED FIELD SCHEDULE ON WATER LEVEL STATIONS

Month		Basic Station				Primary Station				Secondary Station			Specified Station
		D.M.	C.S.	Inspection		D.M.	C.S.	Inspection		D.M.	C.S.	Insp.	Annual inspect.
				S.Te	M.Te			S.Te	M.Te			S.Te	Hy
Jan.		②	○	○									
Feb.		②		○	(Cal)	①	○	△		①		△	
Mar.		②		○					(Cal)		○		
Apr.		②		○		①		○		①		○	◎
May		②		○									
June	Mon soon	③		○	Stand by at office	②		△	Stand by at office	①		△	
July		③		○		①		○		①		○	
Aug.		③		○		②		△					
Sep.		③		○		②		△		①		△	
Oct.		②		○									
Nov.		②		○		①		○		①		○	
Dec.		②		○									
Total Number		36	1	Weekly	2	10	1	3	2	6	1	3	1

Remarks

D.M. : Discharge Measurement
C.S. : Cross-Section Survey
S.Te : Station field technician
M.Te : Mechanical technician
Hy : Hydrologist
(n) : Number of D.M.
(Cal) : Calibration of instruments
○ : as scheduled
△ : as required

1) Annual inspection by Hydrologist shall be carried out according to results of field inspection by technicians.
2) Data collection shall be conducted at the time of discharge measurements.
3) Number of discharge measurements does not include Temporary Measurement

Table 7.11 SUMMARY OF OBSERVATION SYSTEM IN LONG TERM PROGRAMME

	Basic Station	Primary Station	Secondary Station
1) Observation instruments	i) Staff Gauge facility (3 Sections) ii) Water Level Recorder & Facility iii) Bank Operation Double drum winch cable way iv) Point integrated sample v) Portable meters and electrodes for water quality observation	i) Staff gauge facility (3 Sections) ii) Water level recorder & facility iii) Mountainous area →Double drum winch cable way (Bank operating) Terai area →Single drum winch cable way (with cable car) iv) Depth integrated sample v) Portable meters and electrodes for water quality observation	i) Staff gauge only (1 Section) ii) Single drum winch cable way with cable car
- Flood measurements			Peak water level gauge (Flood-crest gauge)
2) Water level observation			
- Regular	3 times per day (8, 12, 16)	3 times per day (8, 12, 16)	3 times per day (8, 12, 16)
- Flood	every hour during flood	every hour during flood	every hour during flood
3) Discharge measurement			
- Regular measurement	twice a week in dry season once a week in monsoon season A minimum total of 36 times per year	a minimum of 10 times per year	a minimum of 6 times per year
- Flood measurement	i) Shortened and optimized measurement by bank operating current meter ii) Float method iii) Slope area method	ditto	i) Float method ii) Slope area method
4) Sediment observation	Point integrated sampling	Depth integrated Sampling	no observation
- Regular	once a week in dry season once a day in monsoon season	ditto	
- Flood	every hour during flood	every hour during flood	
5) Water quality observation	Once a day for basic properties e.g. temperature, PH, conductivity turbidity, others per month	ditto (550.05 only)	no observation
6) Inspection and Maintenance	Stationed staffs carry out frequent inspection and continuous maintenance. Mechanic/Electric inspection is Carried out by mechanics once a year	Field technicians in branch office carry out inspection and mechanics conduct Mechanical/Electric Inspection once a year	ditto
7) Staff	Two stationed field technicians stay in all year	Field technicians in branch office	Field technicians in branch office

Table 7.12 NUMBER OF OBSERVATION STATION IN CHARGE OF BASIN OFFICE

Basin Office		Far Western	Western	Central	Eastern	Total
Location of Office		Nepalgunj	Pokhara	Kathmandu	Biratnagar	4
Branch Office		1. Bangga 2. Chainpur 3. Simikot 4. Jumla 5. Musikot	1. Jomsom	1. Simara	1. Okhaldhunga 2. Khandbari 3. Taplejung	10
Main Basin		Mahakali Karnali Babai West Rapti Tinau	Narayani	Bagmati	Kamala Kankai Sun Koshi	
	Basin Area (km2)	67,619	31,726	10,196	37,640	147,181
Hydrometric Station	Basic Station	5	1	1	3	10
	Primary Station	13	11	2	12	38
	Secondary Station	28	16	3	15	62
	Total	47	28	6	30	110
Precipitation Station	Recording Station	21	19	6	14	60
	Non-recording Station	175	95	37	103	410
	Total	196	64	43	117	470

Table 7.13 TOTAL NUMBER OF REQUIRED ENGINEERING STAFFS (1/2)

Office	Remarks	Number of staffs
1. Central Office		
1.1 Evaluation Division	Chief	1
1.2 Data Management Division	Chief	1
	Staff	2
1.2.1 Management Section		
1.2.1.1 Progress Control Unit		1
1.2.1.2 Quality Control Unit	Chief	1
	Data Processing Staff	4
	Observation	1
Laboratory	Chief	1
	Sediment	2
	Water Quality	2
Workshop	Chief	1
	Observation Equipment	4
	Computer Maintenance	2
Sub-Total (1.2.1)		19
1.2.2 Data Arrangement Section	Chief	1
1.2.2.1 Data Storing Unit	Chief	1
	Data Arrangement	2
	Maintenance of Software	4
1.2.2.2 Data Dissemination Unit	Staff	2
Sub-Total (1.2.2)		10
Sub-Total (1)		33
2. Basin Office		
2.1 Far Western Basin Office	Chief	1
a Data Arrangement Unit	Data Entry	1
	Data Processing	2
b Observation Unit		4
c Laboratory Unit		2
d Workshop Unit		3
Sub-Total (2.1)		13
2.2 Western Basin Office	Chief	1
a Data Arrangement Unit	Data Entry	1
	Data Processing	2
b Observation Unit		6
c Laboratory Unit		2
d Workshop Unit		2
Sub-Total (2.2)		14
2.3 Central Basin Office	Chief	1
a Data Arrangement Unit	Data Entry	1
	Data Processing	2
b Observation Unit		2
c Laboratory Unit		0
d Workshop Unit		0
Sub-Total (2.3)		6
2.4 Eastern Basin Office	Chief	1
a Data Arrangement Unit	Data Entry	1
	Data Processing	2
b Observation Unit		4
c Laboratory Unit		2
d Workshop Unit		2
Sub-Total (2.4)		12
Sub-Total (2)		45

Table 7.13 TOTAL NUMBER OF REQUIRED ENGINEERING STAFFS (2/2)

Office		Remarks	Number of staffs
3.	Branch office		
3.1	Bannga		2
3.2	Chainpur		2
3.3	Simikot		2
3.4	Jumla		2
3.5	Musikot		2
3.6	Jomson		2
3.7	Simla		2
3.8	Okhalding		2
3.9	Khadbari		2
3.10	Taplejung		2
	Sub-Total (3)		20
4	Basic Station		
4.1	Mahakali		2
4.2	Karnali		2
4.3	Babai		2
4.4	West Rapti		2
4.5	Tamur		2
4.6	Gandaki		2
4.7	Bagmati		2
4.8	Kamara		2
4.9	Koshi		2
4.10	Kankai		2
	Sub-Total (4)		20
5	Synoptic Station		
5.1	Dandeldhura		2
5.2	Dhangadhi		2
5.3	Dipayal		2
5.4	Surkhet		2
5.5	Jumla		1
5.6	Ghorai		2
5.7	Bhairhawa		2
5.8	Pokhara		2
5.9	Simla		1
5.10	Kathmandu		2
5.11	Okhaldhunga		1
5.12	Dhankuta		2
5.13	Biratnagar		2
5.14	Taplejung		1
	Sub-Total (5)		20
	Grand-Total		138

Table 7.14 (1) OBSERVATION EQUIPMENTS TO BE PROPOSED IN THE LONG TERM PROGRMME

Item		Instrument/Facility		first stage (up to 1995)	second stage (from 1996 to 2000)	third stage (from 2001 to 2005)	Total Number
Precipitation Observation		Ordinary gauge	Repair/Replacement	82	65	43	190
			New installation	–	102	102	204
		Rainfall recorder including foundation	Replacement	4 (3 tipping & weighing type)	10 (10 tipping type)	–	14 *1
			Addition	10 (10 tipping type)	15 (10 tipping & 5 weighting type)	7 (7 tipping type)	32
Water level and Discharge measurement	Basic station (10)	Staff gauge	Addition *2	20 sec. (9 stations)			20
		Water level recorder	New installation	6 + 1 (4 float & 3 pressure type)			7
			Improvement *3	4 (4 float type)			4
		Gauge well	Maintenance/Repair	5			5
		Construction of pressure gauge	New construction	3			3
		Double drum winch	New installation	6 + 1			7
		Construction of double drum winch cable way	New construction	5			5
			Improvement	2			2
		Office building construction	New construction	5			5
	Primary station (38)	Staff gauge	Addition *2		68 sec. (34 existing stations)		68
			New installation		12 sec. (4 new stations)		12
		Water level recorder	New installation		20 (13 float & 7 pressure type)		20
			Improvement *3		17 (13 float & 4 pressure type)		17
		Gauge well	New construction		11 (9 existing & 2 new stations)		11
			Improvement		5		5
		Construction of pressure gauge	New construction		7 (5 existing & 2 new stations)		7
		Double drum winch	New installation		25		25
		Construction of double drumwinch cable way	New construction		25		25
		Construction of single winch cable way	New construction		2 (1 existing & 1 new station)		2
			Repair/Temp. Repair *5	14			14
	Secondary station (67)	Staff gauge	New installation			17 sec. (17 new stations)	17
		Peak gauge	New installation			62 sec. (45 existing & 17 new stations)	62
		Construction of single winch cable way	New construction			27 (10 existing & 17 new stations)	27
			Repair			15	15
	Basic	Current meter	Addition	9 (9 propeller type)			9
	primary		ditto	16 (11 propeller & 5 price type)	15 (5 propeller & 10 price type)		31
	Basin office	Survey equipment	Addition	5 LS			5 LS

Table 7.14 (2) OBSERVATION EQUIPMENTS TO BE PROPOSED IN THE LONG TERM PROGRAMME

Sediment Observation	Basic Station	Point integrated sampler	New installation	9			9
		Turbidity meter	ditto	11 (including No. 550.05)			11
	Primary Station	Depth integrated sampler	Addition	5			5
		Turbidity meter			5		5
	Sediment Station	Electric oven/balance	Addition	4 sets			4
		Sieve, Hydrometer, etc.	New installation		4 sets		4
W. Quality Observation	Basic Station	Field test kits	New installation		11sets x 5years (incl. No. 550.05)	11sets x 5years (incl. No. 550.05)	
		Measuring sensors	ditto		3 sets	8 sets	11
	W.Q. Labo	BOD/COD meter	ditto		1	1	2
Work Shop	Central W. Shop	Repair/Calibration	Addition	1 LS			
	Basin W. Shop	Repair	New installation		1 LS		
Data Processing		Hand terminal/software		1 LS	1 LS		
		Memory card		1 LS	1 LS	1 LS	
Training	Foreign expert	Overall observation		24 MM (foreign expert)	60 MM (foreign expert)	60 MM (foreign expert)	144 MM
		Calibration for current meter		6 MM (ditto)	6 MM (ditto)		12 MM
		Sediment/Water Quality Observation		6 MM (ditto)	6 MM (ditto)	6 MM (ditto)	18 MM
	Manufacture	Instrument Manufacture		8 tips	12 tips	12trips	32 trips

NOTE : * 1 14 recording gauges in Model system are not included.
* 2 3 sections of staff gauge are required at Basic and Primary stations
* 3 Addition of data logger system
* 4 Temporary winchs will be replaced double winch which installed in second stage

Table 7.15 COST ESTIMATION

(Unit : 1,000 NRs)

WORK ITEM			F/C	L/C	First Stage (Immediate Programme)		Second Stage		Third Stage (Long Term Programme)		Grand - Total		
					F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C+L/C
(A) Observation	(1) Rainfall Observation	Manual Raingauge		Manual Gauge / Foundation	0	1,320	0	1,020	0	1,020	0	3,360	3,360
		Tipping Bucket Type	Raingauge / Recorder / Data Logger	Manual Gauge / Foundation	6370	1,000	9,800	1,000	3,430	730	19,600	2,730	22,330
		Weighing Type	Raingauge / Recorder	Manual Gauge / Foundation	192	0	960	650	0	0	1,152	650	1,802
		Spare Inst. / Parts etc.	Spare Parts	Repair / Manual Gauge	656	0	1,075	650	343	430	2,074	1,080	3,154
	(2) Water Level Observation	Staff Gauge		Plate / Foundation	0	360	0	1,620	0	306	0	2,286	2,286
		Float-type	Recorder / Data Logger	Gauge Well / Gauge House / Cleaning / Repairing	1,108	110	3,601	14,360	0	0	4,709	14,470	19,179
		Pressure-type	W.L. Gauge / Data Logger	Protection Pipe / GI Pipe	1,524	363	3,556	847	0	0	5,080	1,210	6,290
		Peak Water Level Gauge		GI Pipe / Foundation	0	0	0	0	0	1,860	0	1,860	1,860
		Survey Instrument	Level / Transit		2,250	0	0	0	0	0	2,250	0	2,250
		Spare Inst. / Parts etc.	Spare Parts / Data Logger		681	0	4,309	0	157	0	5,147	0	5,147
	(3) Discharge Measurement	Single Winch		Tower / Cable / Winch / Cableway / Foundation	0	3,094	0	1,325	0	19,890	0	24,310	24,310
		Double Winch	Double Winch / Suspention Wire	Operation House / Anchor Block / Wire	10,576	5,970	35,694	26,190	0	0	46,270	32,160	78,430
		Propeller-type Current Meter	Body / Weight / Counter		15,490	0	3,580	0	0	0	19,070	0	19,070
		Price-type Current Meter	Body / Weight / Counter		2,580	0	5,160	0	0	0	7,740	0	7,740
		Spare Inst. / Parts etc.	Spare Parts		1,807	0	874	0	0	0	2,681	0	2,681
	(4) Sediment Observation	Point Integrated Sampling	Sampler Bottle / Tubidity Meter		6,352	0	0	0	0	0	6,352	0	6,352
		Depth Integrated Sampling	Sampler Bottle / Tubidity Meter		1,105	0	1,525	0	0	0	2,630	0	2,630
		Spare Inst. / Parts etc.	Spare Parts		746	0	153	0	0	0	899	0	899
	(5) Water Quality Observation	Field Test Kit			0	0	0	550	0	550	0	1,100	1,100
		Sensor			0	0	828	0	2,208	0	3,036	0	3,036
	(6) Basic Station	Office		Building	0	1,850	0	0	0	0	0	1,850	1,850
Sub - Total (A)					51,437	14,067	71,115	48,213	6,138	24,786	128,690	87,066	215,756
(B) Analysis of Sediment and Water quality	(1) Sediment Analysis	Sediment Labo.	Laboratory Equip.		1,220	0	172	0	0	0	1,392	0	1,392
	(2) Water quality Analysis	Water quality Labo.	Laboratory Equip.		0	0	832	0	832	0	1,664	0	1,664
Sub - Total (B)					1,220	0	1,004	0	832	0	3,056	0	3,056
(C) Management of Facility	(1) Maintenance of Station	Regional Workshop	Repair Equip. and Tools	Repair Tools / Building / Furnitures	0	0	1,112	0	0	0	1,112	0	1,112
	(2) Repair of Equip.	Central Workshop	Repair Equip. and Tools	Repair Tools	1,108	0	0	0	0	0	1,108	0	1,108
	(3) Current Meter Calibration Facility		Calibration Equip.	Calibration Tank	21,073	6,663	0	0	0	0	21,073	6,663	27,736
Sub - Total (C)					22,181	6,663	1,112	0	0	0	23,293	6,663	29,956
(D) Data Processing and Management	(1) Data Collection	Telemetry	Telemetry Equip.	Building / Foundation	0	0	0	0	25,641	637	25,641	637	26,278
	(2) Data Processing	Data Logger System	Reader / Memory Card		4,954	0	5,488	0	2,700	0	13,142	0	13,142
Sub - Total (D)					4,954	0	5,488	0	28,341	637	38,783	637	39,420
(E) Data Quality Improvement and Training	(1) Staff Training	Invitation of Foreign Expert			27,576	0	55,152	0	49,353	0	132,081	0	132,081
		Training in Manufacture			1,466	0	2,199	0	2,199	0	5,864	0	5,864
		Attendance of International Cource			732	0	1,830	0	1,830	0	4,392	0	4,392
	(2) Training Center		Computer Equip./ Observation Inst./ Building	Building / Furniture / Land 5,000 m2	48,598	42,217	0	0	0	0	48,598	42,217	90,815
Sub - Total (E)					78,372	42,217	59,181	0	53,382	0	190,935	42,217	233,152

Table 8.1 LIST OF RECORDING RAINGAUGE STATIONS IN THE IMMEDIATE PROGRAMME

NO.	INDEX NUMBE	NAME OF STATION	RIVER BASIN	ELE-VATION (m)	TYPE OF RECORDER EXIST	PLAN	REMARKS
1	219	DHANGADHI	II	170	NS+	TP+d	to be replaced
2	303	JUMLA	III-3	2,300	AC+	WE	to be replaced
3	804	POKHARA AIRPORT	VIII-4	827	WE+	TP+d	to be replaced
4	1319	BIRATNAGAR AIRPOART	XV	72	FS+	TP+d	to be replaced
5	218	DIPAYAL (DOTI)	III-4	617		TP+d	newly installed
6	312	DUNAI	III-5	2,058		TP+d	newly installed
7	416	NEPALGUNJ (REG.OFF.)	V	144		TP+d	newly installed
8	725	TAMGHAS	VIII-5	1,530		TP+d	newly installed
9	1002	ARU GHAT D. BAZAR	VIII-2	518		TP+d	newly installed
10	1103	JIRI	XIV-2	2,003		TP+d	newly installed
11	1107	SINDHULI GADHI	XIV-6	1,463		TP+d	newly installed
12	1212	PHATEPUR	XIV-6	100		TP+d	newly installed
13	1301	NUM	XIV-4	1,497		TP+d	newly installed
14	1421	GAIDA (KANKAI)	XVII	143		TP+d	newly installed
15	104	DANDELDHURA	I	1,865	WE		existing
16	406	SURKHET(BIRENDRA NAGAR)	III-5	720	WE		existing
17	705	BHAIRHAWA AIRPORT	VII	109	WE		existing
18	1307	DHANKUTA	XIV-5	1,447	WE		existing
19	1405	TAPLEJUNG	XIV-5	1,732	WE		existing
20	909	SIMARA AIRPORT	IX	130	NS		existing
21	1030	KATHMANDU AIRPORT	X	1,336	NS		existing
22	1206	OKHALDHUNGA	XIV-3	1,720	NS		existing
23	1304	PAKHRIBVAS	XIV-4	1,680	FS+		existing
24	515	GHORAI	IV	725	FS		existing
25	623	YARAGAU	VIII-5	3,620	WE		Model system
26	623	SALLYAN	VIII-5	1,460	WE		Model system
27	624	SAMARGAU	VIII-5	3,570	WE		Model system
28	625	DAKARJUNG	VIII-5	3,160	WE		Model system
29	626	BEGA	VIII-5	1,770	WE		Model system
30	627	KUHUN	VIII-5	1,550	WE		Model system
31	628	MUNA	VIII-5	1,970	WE		Model system
32	629	BAGHARA	VIII-5	2,330	WE		Model system
33	630	SIRKON	VIII-5	790	WE		Model system
34	828	KHULDI DOBAN	VIII-5	2,400	WE		Model system
35	830	PAMDUR	VIII-4	1,160	TP+d		Model system
36	831	TISEDI	VIII-5	1,100	WE		Model system
37	923	KOLBHI	IX	109	WE		Model system
38	924	CHYUNTAHA	IX	86	WE		Model system

NOTE : Type of Recording Raingauge
WE : Weighing-type Raingauge
NS : Natural siphone-type Raingage
TP : Tipping-buket-type Raingauge
+d : equip with Data logger

Table 8.2 PRESENT CONDITION OF BASIC STATIONS

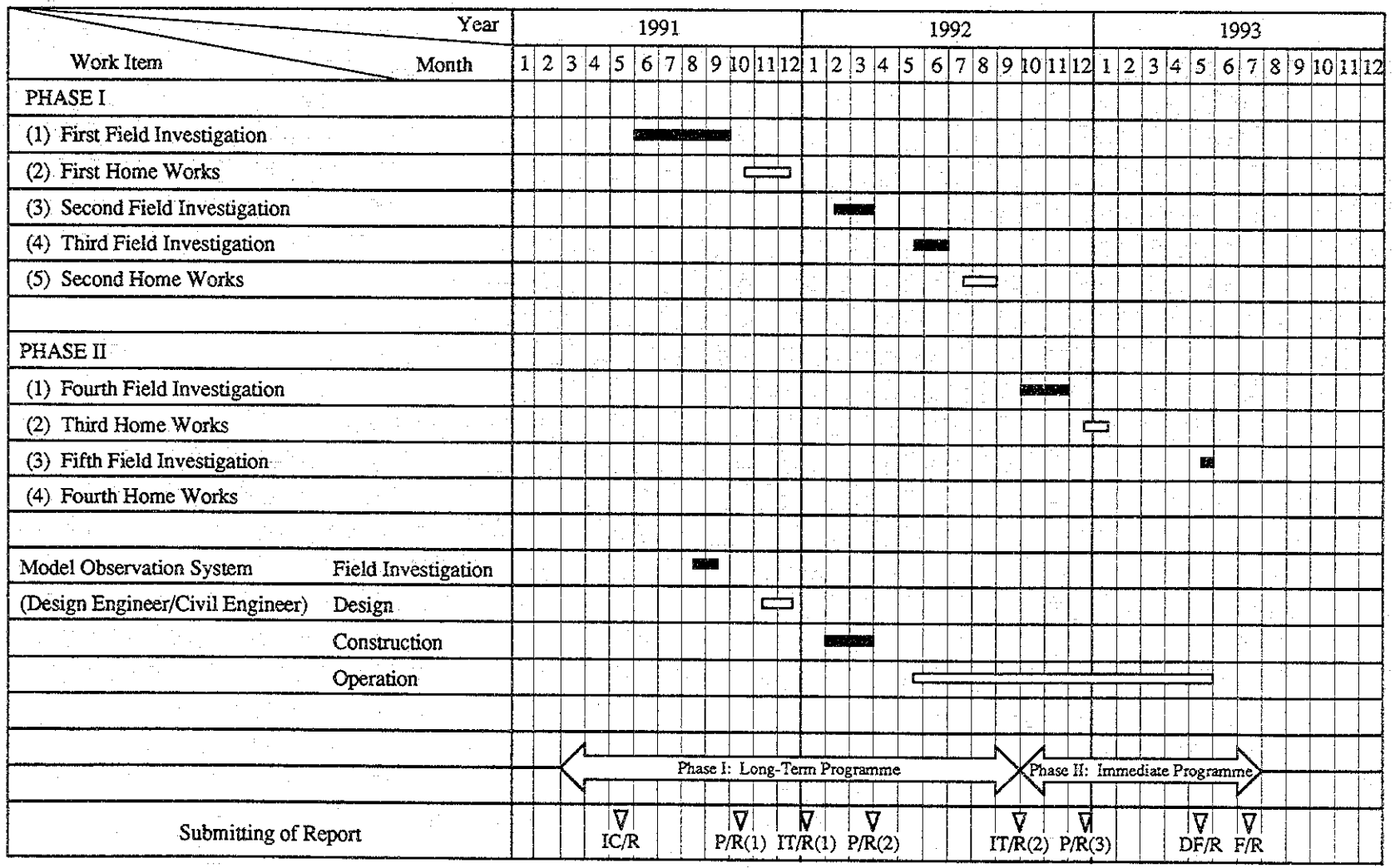
Station Name	General Condition of the Station	Remarks
150 Makakari (Pachashwar)	This station is running in good condition. Stationed NEA staffs carry out observations such as water level, discharge measurement and sediment observation in cooperation with India. No DHM staffs participate.	Mahakari Project (NEA)
280 Kalnali (Cisapani)	This station is running in good condition. Water level, discharge measurement and sediment observation are conducted jointly by NEA and DHM staff.	Karnali Multipurpose project (NEA)
289.95 Babai (Chepang)	Low water level is a little below the bottom of the intake pipe due to scouring the river bed and gauge well is subject to disposition of silt every year. Lack of records occurs about 1 month.	
350 West Rapti (Bagasoti Gaon)	The intake is left dry in the low water season owing to scouring the river bed and the intakes and gauge well is frequently silted-up with fine sediment.	
390 Tinau (Butwal)	This station should be relocated in suitable site. Since the old gauge well was washed away due to big flood in 1981, no new gauge well has constructed at the present site.	
450 Gandaki (Narayanghat)	The intakes and gauge well are frequently silted-up with fine sediment. Span of cable way is around 200 m.	Flood forecasting project
589 Bagmati (Pandhera dovan)	The intake and gauge well are frequently silted-up with fine sediment	ditto
598 Kamala (Chisapani)	This station should be relocated on suitable site. No gauge well and cable way has not been constructed due to wide flood plain of the present site. Adjacent bridge is useful for discharge measurement.	
695 Sapta Koshi (Chatara Kotsu)	An old gauge well was washed away due to flood in 1980. A new gauge well has constructed in 1989, however no water level recorder has installed. Span of cable way is around 200 m.	Flood forecasting project
795 Kankai (Mainachauli)	Aggregation of river bed has occured due to downstream irrigation weir. The gauge well and intakes suffer from silting problem frequently.	ditto

Table 8.3 COST ESTIMATION OF THE IMMEDIATE PROGRAMME

Item		Instrument and facilities		Unit	Amount	FC x1000NRp	LC X1000NRp	Remarks
Precipitation Observation		Ordinary Raingauge Repair		L.S.	82	-	1,320	
		Recording Raingauge Replacement	Tipping - type	PCS	3	1,470	-	0219, 0804,1319
		ditto	Weighing - type	PCS	1	192	-	0218
		Addition	Tipping - type	L.S.	10	4,900	1,000	0218, 0312,0416, 0725, 1002, 1103,1107,1212, 1301, 1421
		Spare parts for recording raingauge		L.S.	1	656	-	(including foundation) 10% of recording raingauge
Water level observation/discharge measurement	Basic Station (10)	Staff gauge Addition		Sec.	20	-	360	3 sections of staff gauge are required
		Recording gauge New installation	Float - type	PCS	3 + 1	1,108	-	350, 589, 795
			Pressure - type	PCS	3	1,524	-	289.95, 390, 598
		Improvement	Float - type	PCS	4	380	-	Addition of data logger/150, 280, 450, 695
		Gauge well Maintenance/Repair		L.S.	5	-	110	450, 589, 695, 795/350
		Structure of pressure gauge New construction		L.S.	3	-	363	289.95, 390, 598
		Double winch New installation		PCS	7 + 1	10,576	-	289.95, 350, 390, 450, 589, 695, 795
		Structure of Double winch New construction		L.S.	5	-	4,850	350, 390, 589, 695, 795
		Improvement		L.S.	2	-	1,120	289.95, 450
		Current meter Addition	Propella - type	PCS	9	7,614	-	including weight, sounding cable, accessories
		Office building New construction		L.S.	5	-	1,850	289.95, 350, 390, 598, 695
	Primary Station	Single winch Repair/Temp. Repair*1		L.S.	14	-	3,094	Addition of single winch, replacement of cable
		Current meter	Propeller - type	PCS	11	7,.876	-	including weight, sounding cable and reel
			Price - type	PCS	5	2,580	-	ditto
	Basin Office	Survey Instrument Addition		L.S.	5	2,250	-	level, theodrite
		Spare parts for recording gauge		L.S.	1	681	-	10% of measuring instruments
		Spare parts for discharge measuring equipment		L.S.	1	1,807	-	ditto
Sediment Observation	Basin Station	Point integrated sampler New installation		PCS	8 + 1	2,997	-	389.95, 350, 390, 450, 589, 598, 695, 795
		Turbidity meter		PCS	11	3,355		10 basic stations and No. 550.05
	Primary	Depth integrated sampler New installation		PCS	5	1,105	-	
	Sediment Labo	Electric oven/balance		L.S.	4	1,220	-	
		Spare parts for measuring instruments		L.S.	1	746	-	10% of measuring instruments
	Central Workshop	Workshop Repair/Calibration equipments Addition		L.S.	1	1,108	-	
		Calibration facility for current meter		L.S.	1	21,073	6,664	
Data Processing		Hand terminal/software		L.S.	1	2,254	-	
		Memory Card		PCS	300	2,700	-	
Engineering Service		Foreign expert	Design/Supervision on instruments	M.M.	7	8,043	-	
Training		Foreign expert	Overall observation system	M.M.	24	18,384	-	
			Calibration for current meter	M.M.	6	4,596	-	
			Sediment Observation	M.M.	6	4,596	-	
		Manufacture		Trip	8	1,468	-	2 persons x 4 times

FIGURES

Fig. 1.1 WORK SCHEDULE ON OBSERVATION SYSTEM



Note: IC/R: Inception Report, P/R: Progress Report, IT/R: Interim Report, DF/R: Draft Final Report, F/R: Final Report

Work in Nepal Work in Japan

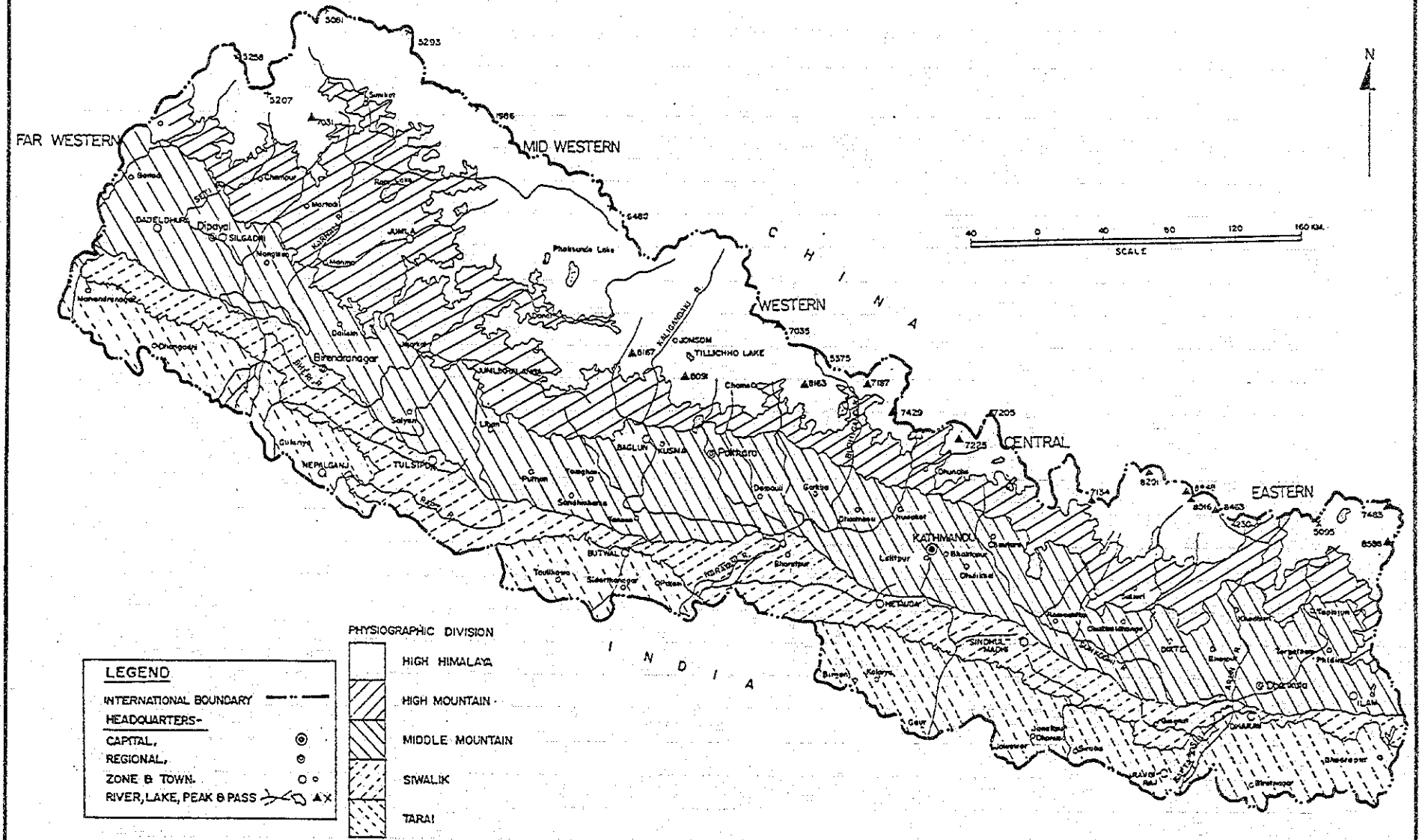


Fig. 2.1 PHY SIOGRAPHIC REGIONS

SOURCE :- Land resource mapping project, 1986.

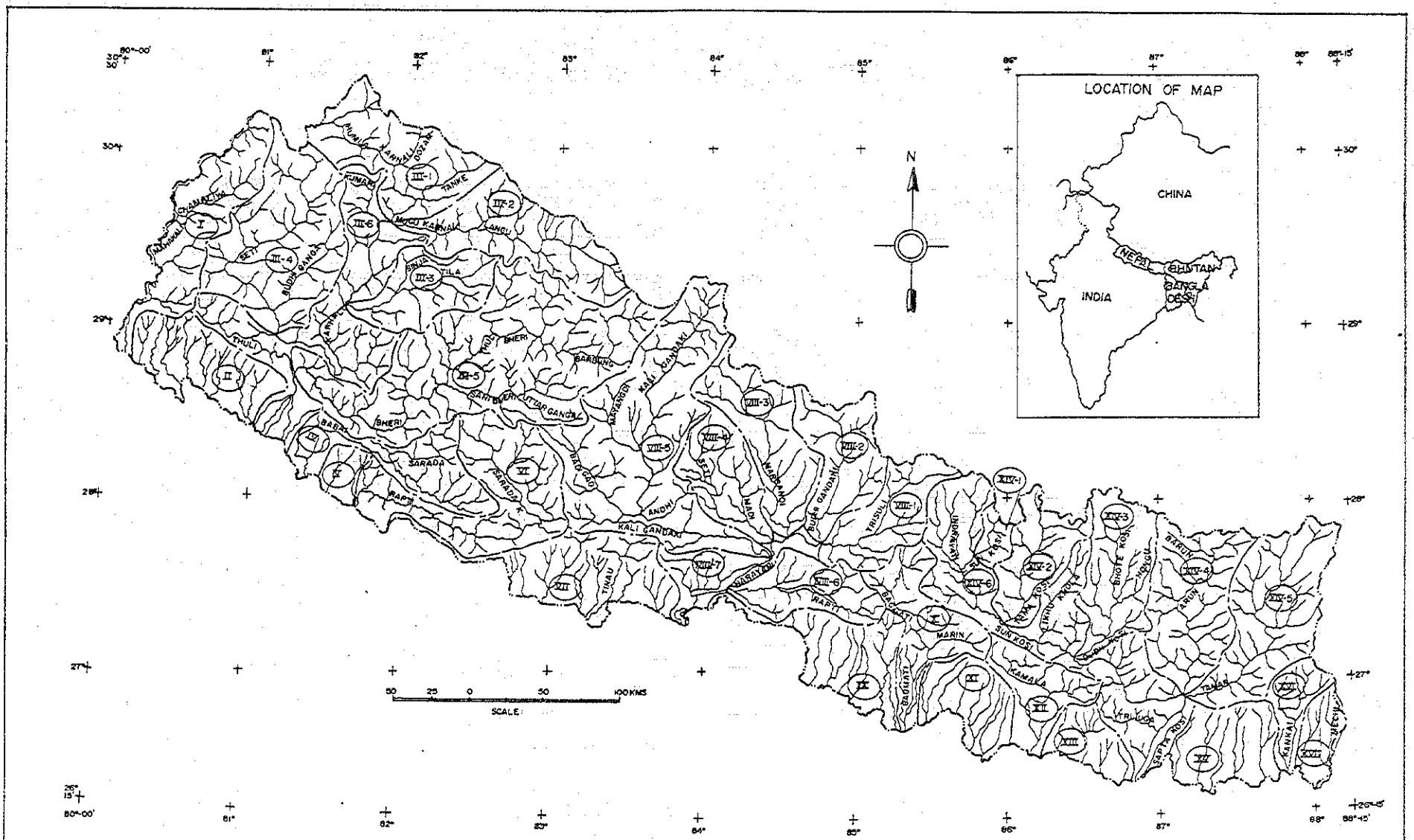


Fig. 2.2 RIVER AND RIVER BASIN IN NEPAL

NOTE: SEE TABLE 3.1. FOR BASIN NAME.

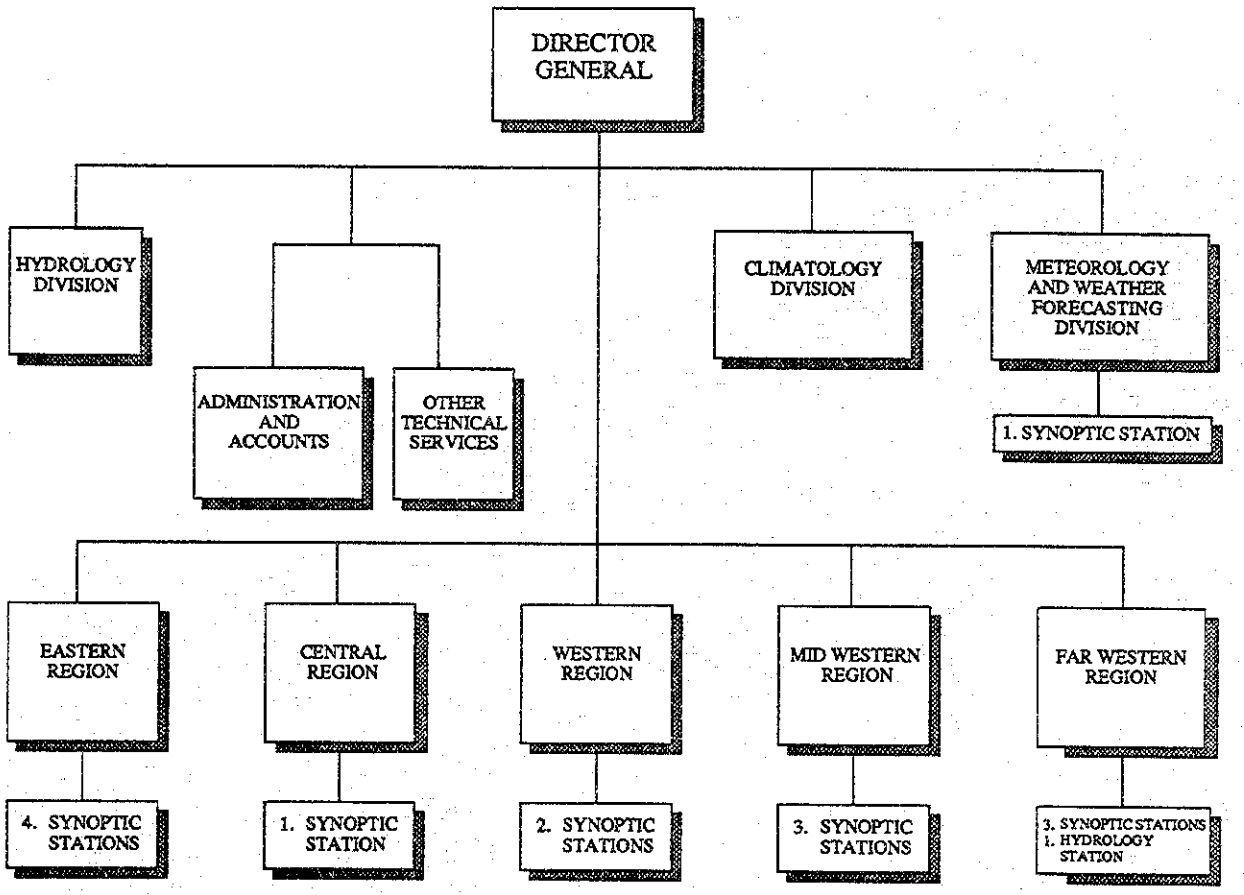


Fig. 3.1 ORGANIZATION CHART OF DHM
(effective till mid-July 1993)

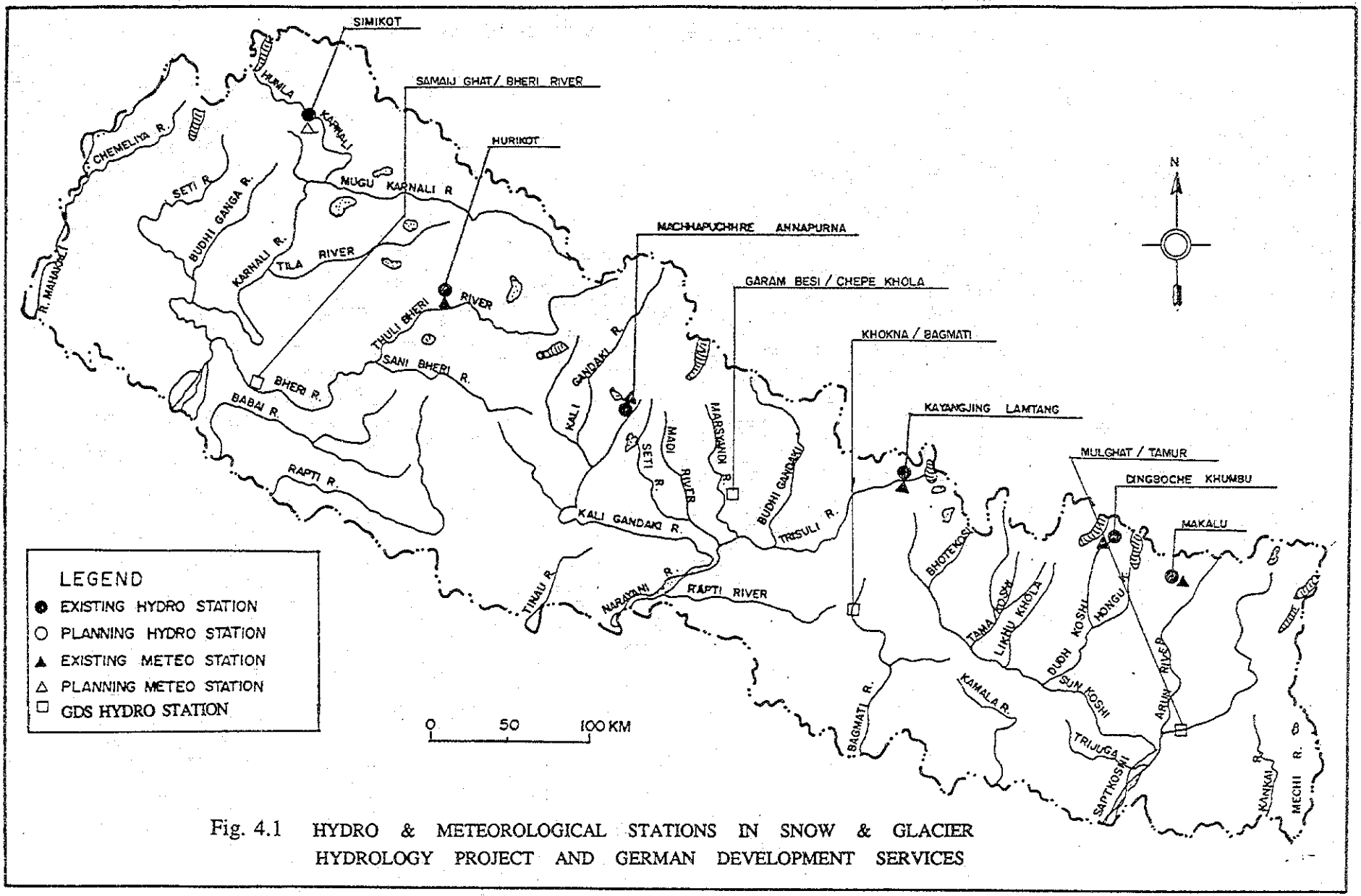


Fig. 4.1 HYDRO & METEOROLOGICAL STATIONS IN SNOW & GLACIER HYDROLOGY PROJECT AND GERMAN DEVELOPMENT SERVICES

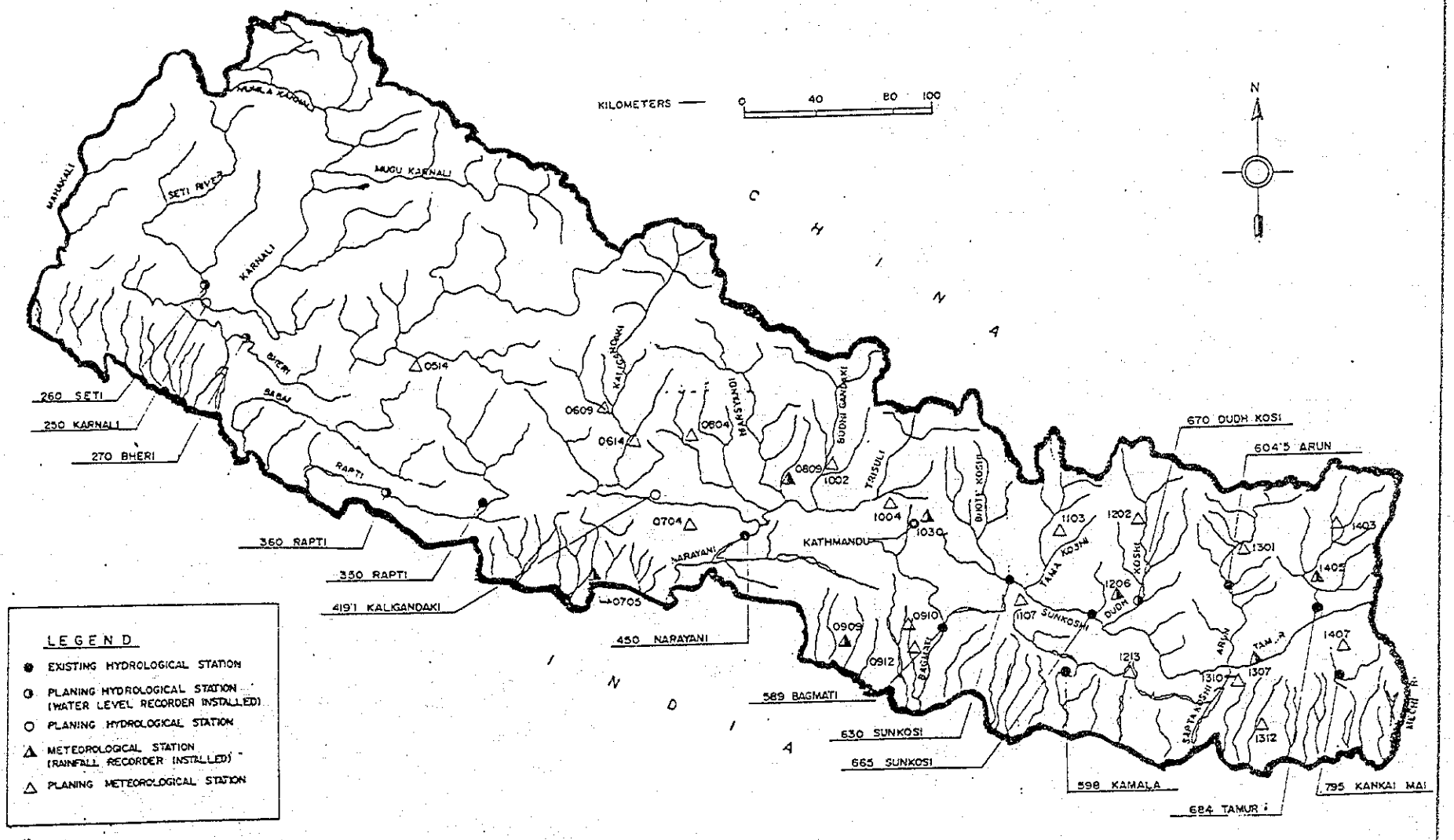


Fig. 4.2 FLOOD FORECASTING STATIONS OF HYDRO & METEOROLOGY

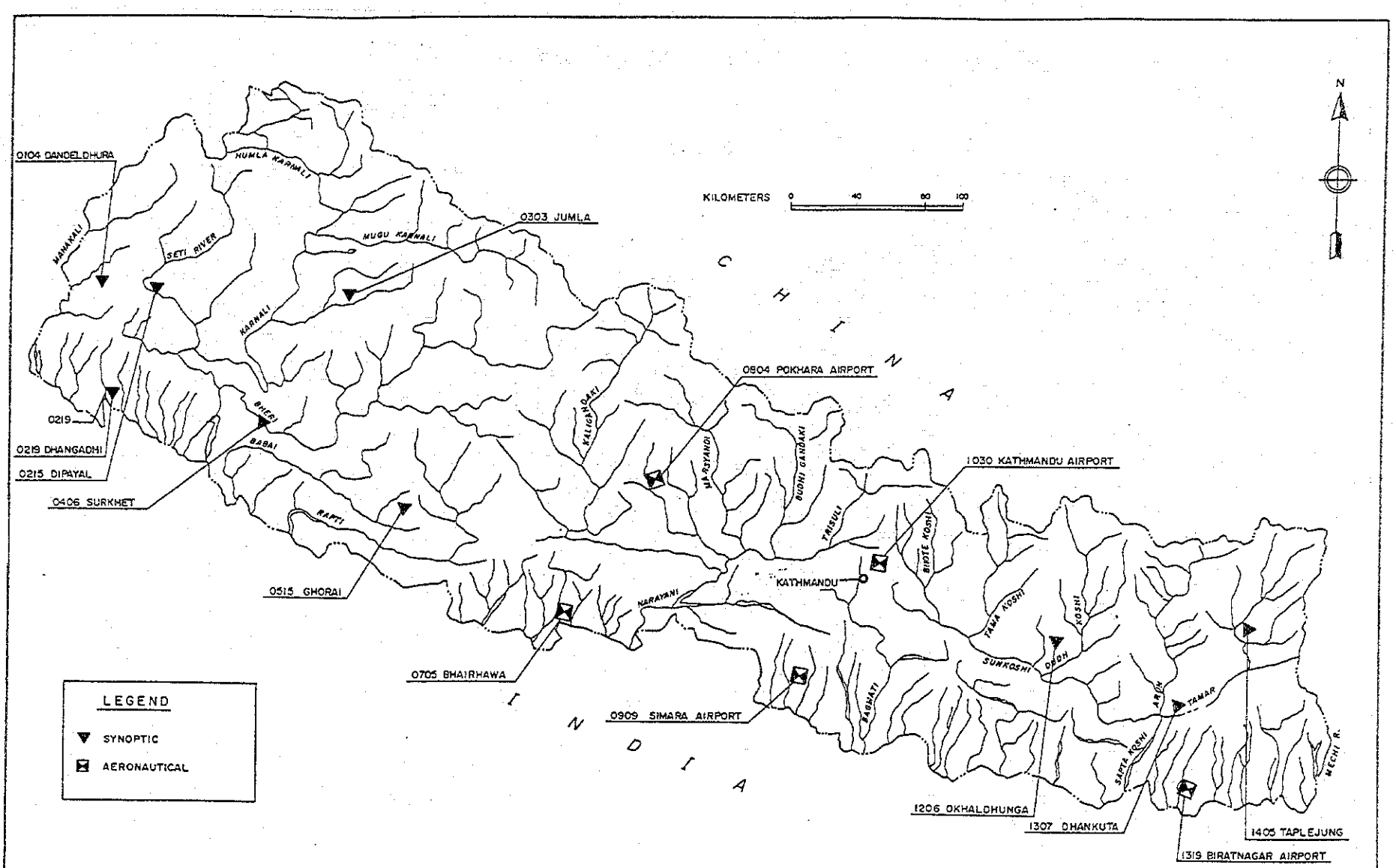


Fig. 5.1 SYNOPTIC AND AERONAUTICAL STATIONS

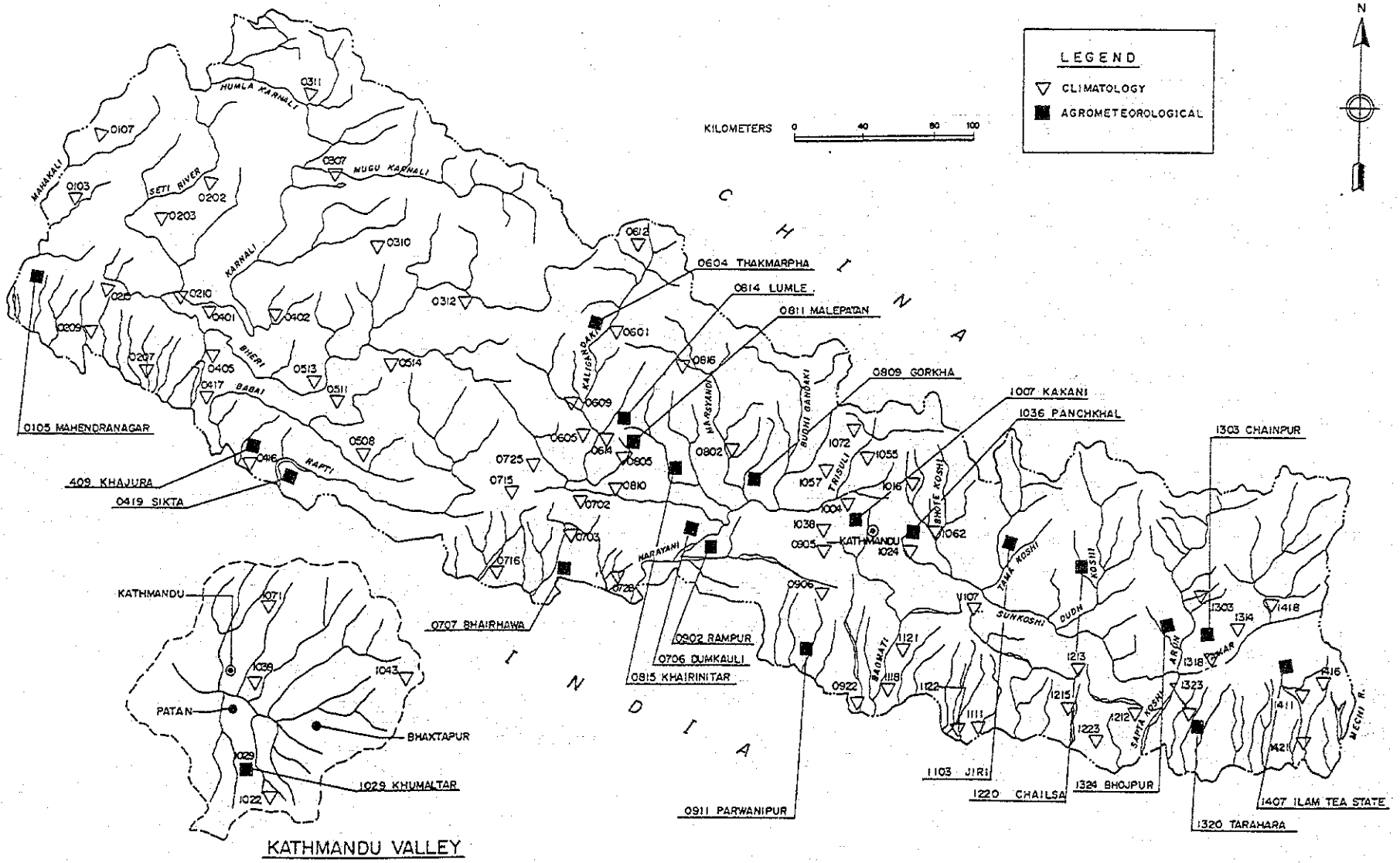


Fig. 5.2 CLIMATOLOGY AND AGROMETEOROLOGICAL STATIONS

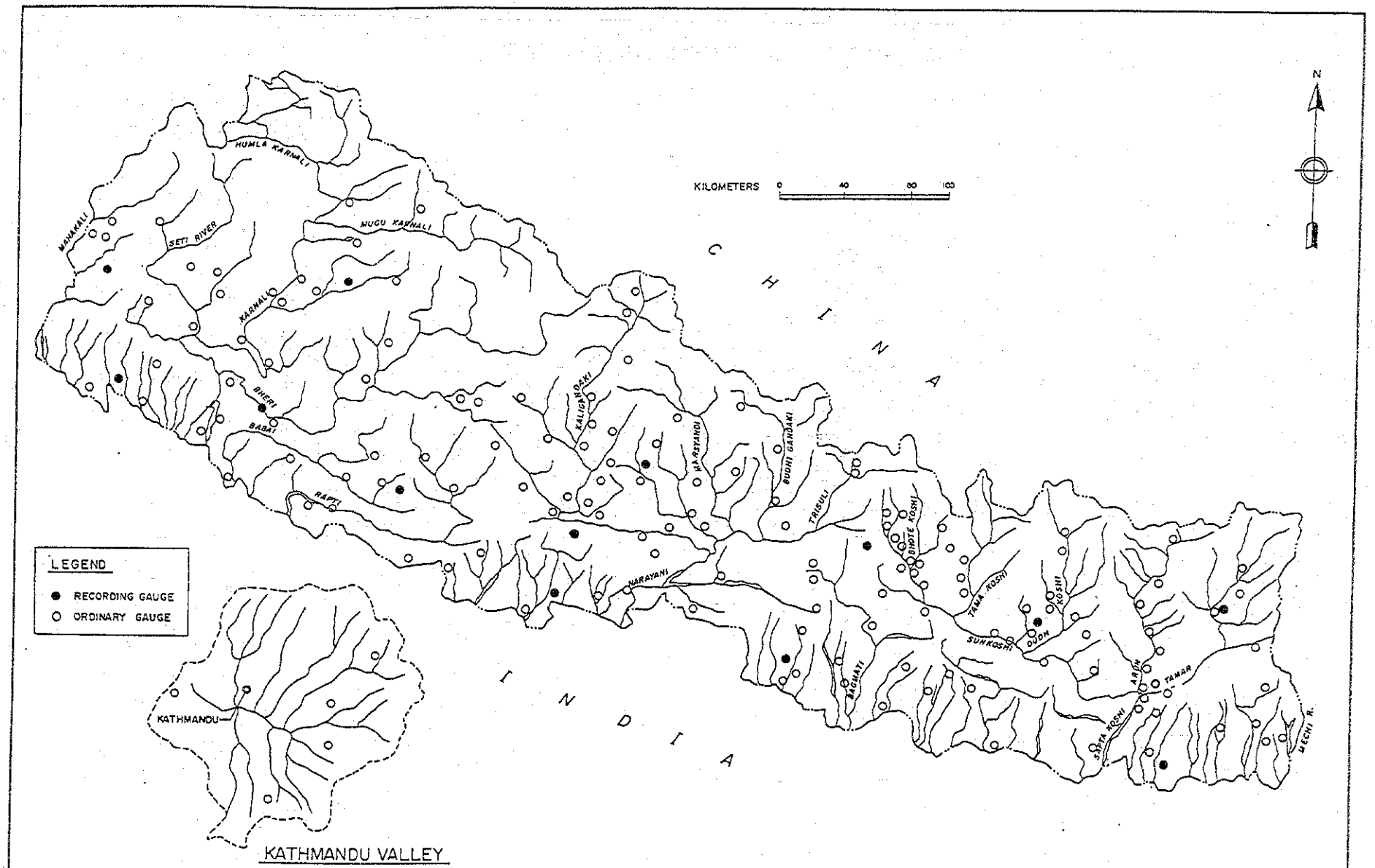


Fig. 5.3 PRECIPITATION STATIONS

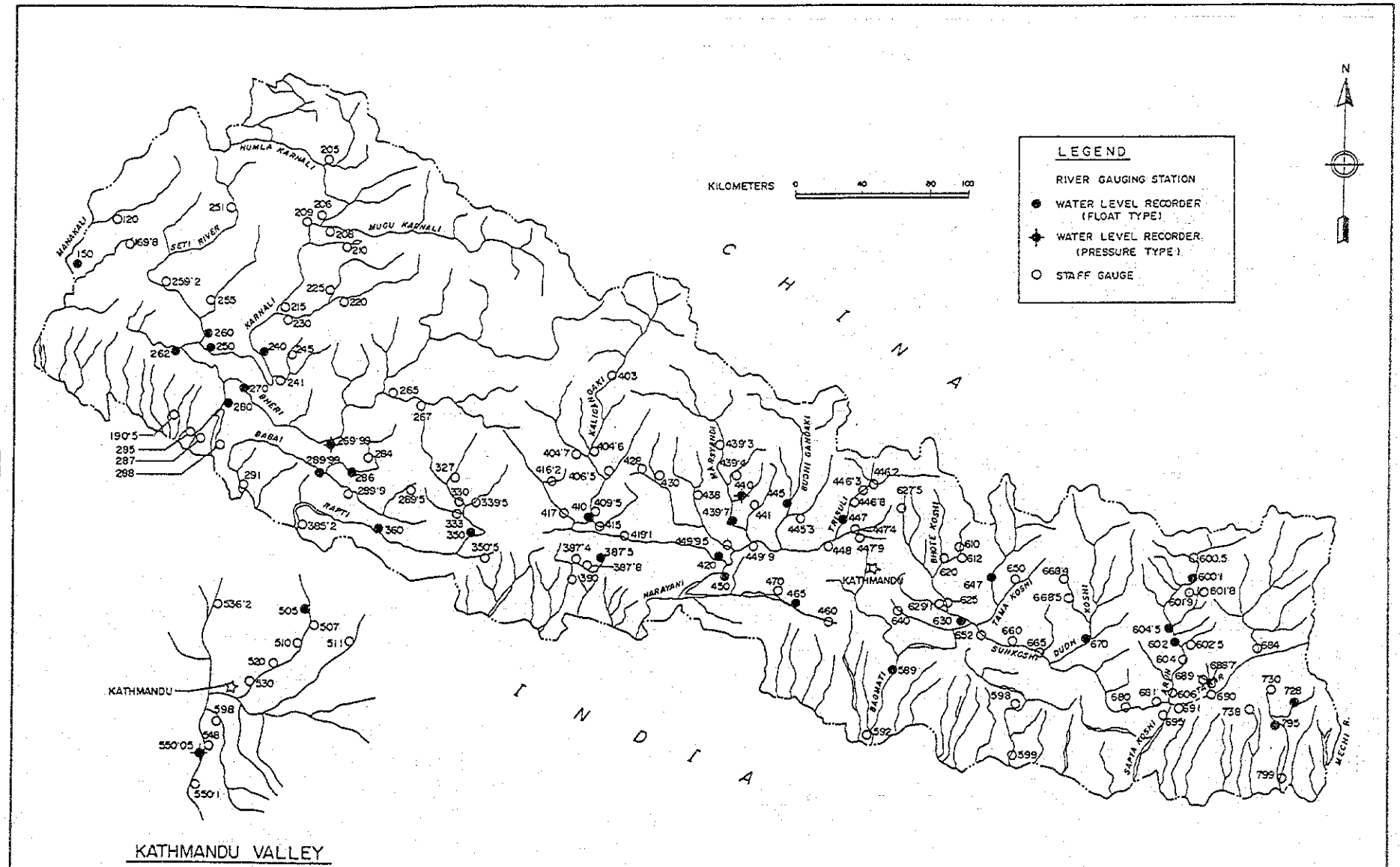


Fig. 5.4 HYDROLOGICAL NETWORK IN NEPAL

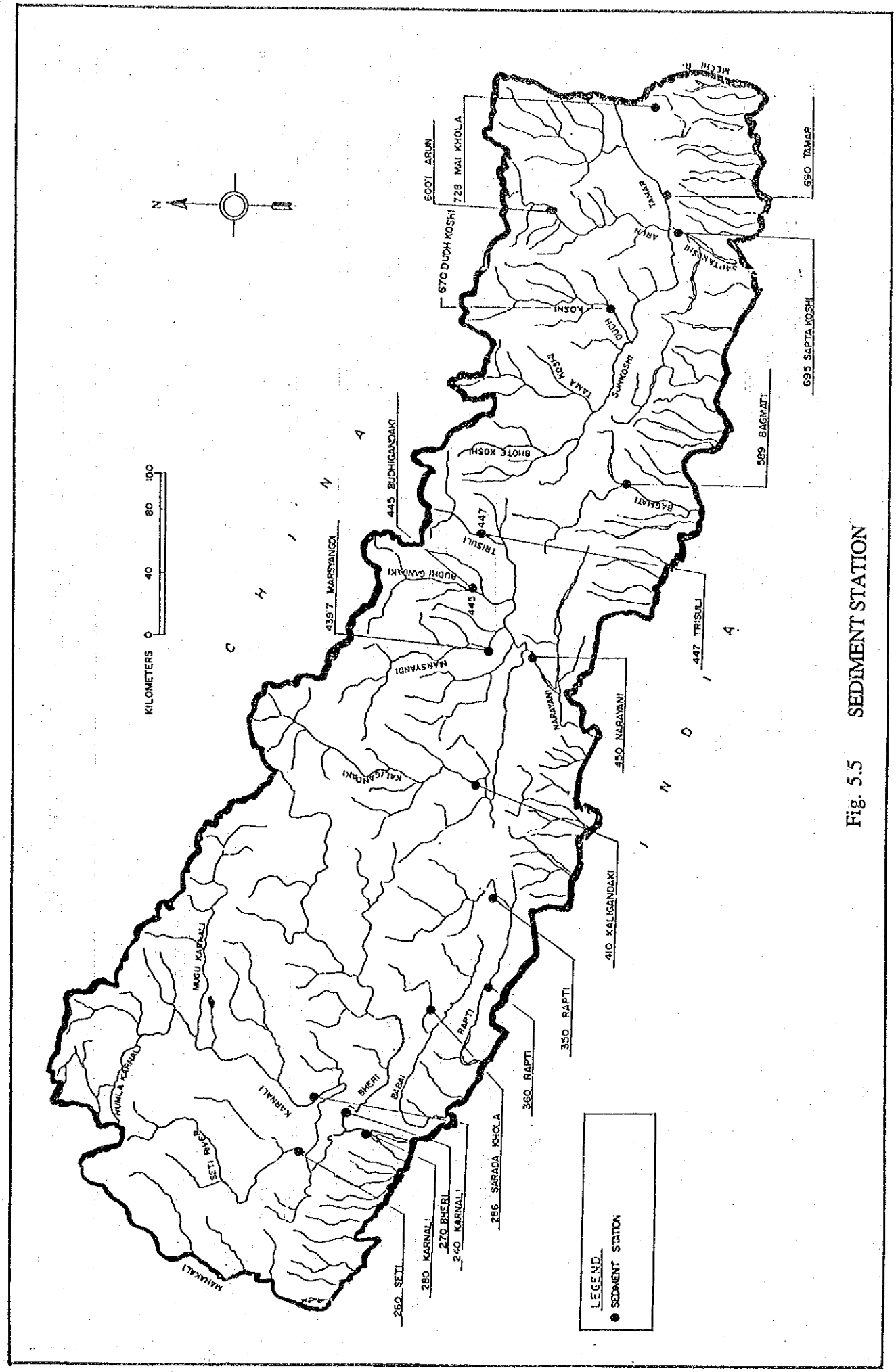


Fig. 5.5 SEDIMENT STATION

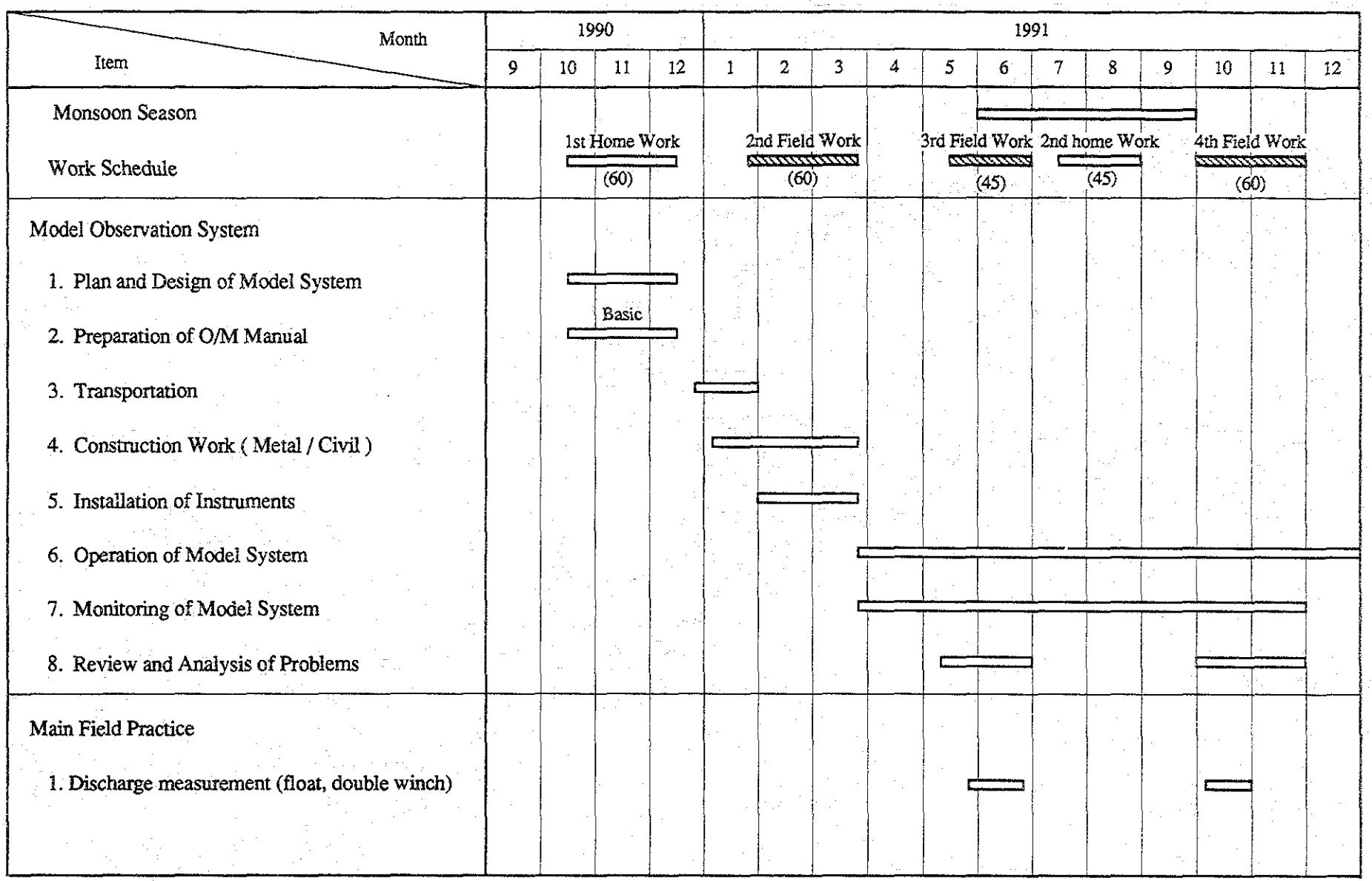


Fig. 6.1 SCHEDULE ON MODEL OBSERVATION SYSTEM