Table 2.1.1 OUTLINE OF PREVIOUS INVOLUNTARY RESETTLEMENTS

Particulars	Rara	Kulekhani	Marsyangdi
1. Purpose of acquisition	National Park	Hydro-electricity	Hydro electricity
2. Years of acquisition/ resettlement	1978-1984	1977-82	1979-88
3. Compensation option:			
a. Land	Land only (in Tariai)	-	-
b. Land or cash	-	Land or cash	-
c. Cash	-	-	Cash only
4. Property acquired:			
a. Land (ha.)	106	175	60.5
b. Houses	300	450	29
c. Other	-	Water Mil (50)	Fruit Trees
5. Compensation rate	-	Rs.1,200 to 3,000 per ropani* (1981)	Rs.400 to 5,500 per ropani (1981)
a. Average cost per family	-	US$2,900 (1979)	US$7,000 (1981)
6. Affected:			
a. Households	331	500	222
b. Population	About 1,820	3,000	1,776
7. Implementation agency	Nepal Resettlement Company	Electricity Department	MHDB**

* : One ropani is approximately 0.05 ha.
** : Marsyangdi Hydro-electricity Development Board.

Source : New ERA "Report on Scio-Economic condition of Affected Households and Recommended Action Plan for Marsyangdi Hydro-electric Project", July 1989

Table 2.2.1 IMPACT PREDICTION OF ARUN III HYDRO PROJECT (1/3)

Resource/ Project Activity	Impacts	Magnitude	Extent	Duration	Mitigation	Responsibility
Topography, Soils, Landuse & Vegetation						
1. Road construction	Changes in drainage systems; loss of vegetation cover; increased run off; cutting of slopes; creation of fill areas; loss of cultivated land	M	L	S	Permanent and temporary road construction methods to follow Schaffner (1987) or other suitable methods;	JV/Contractor
					Replace adit access road with shorter road;	DOR/SWK JV/Contractor
					Reduce No. of switchbacks in favour of longer road sections;	JV/Contractor
					Reduce to extent posssible spoil dumps and associated roads;	JV/Contractor
					Combine adit and powerhouse camps;	JV/Contractor
					Implement slope protection measures;	JV/Contractor
					Reclaim and revegetate all temporary roads;	JV/Contractor
					Salvage soils for use in reclamation;	JV/Contractor
2. Quarry & borrow pits	Changes in drainage system; loss of vegetation cover; cutting of slopes; creation of steep highwall sections; loss of cultivated land	H	L	S	Fill borrow & pits with muck;	JV/Contractor
					Backfill to stable contours; provide top soil;	JV/Contractor
					Excavate by having benches wide enough for later cultivation;	JV/Contractor
					Provide for controlled drainage;	JV/Contractor
					Reforest & revegetate disturbed slopes;	JV/Contractor
					Make temporary facilities subject to approval;	JV/Contractor

Table 2.2.1 IMPACT PREDICTION OF ARUN III HYDRO PROJECT (2/3)

Resource/ Project Activity	Impacts	Magnitude	Extent	Duration	Mitigation	Responsibility
3. Spoil dumps	Loss of cultivated land; creation of fill areas; construction of temporary access roads	H	L	S	Eliminate by using selected spoil for concrete, for road maintenance, as backfill for quarry & borrow pits; Place remainder of spoil in river; Make temporary facilities subject to approval;	JV/Contractor JV/Contractor JV
4. Permanent NEA Camps	Loss of cultivated land; displacement of local residents; changes in drainage systems; increase in erosion potential; creation of tellaces; cutting of slopes	M	L	L	Salvage soils prior to grading ; Minimize height of benches; Install drainage control systems; Revegetate slopes; Reduce area needs by eliminating free standing single family structures; Develop two storey building where possible to reduce building sizes; Compensation payment and additional measures	JV/Contractor JV/Contractor JV/Contractor JV/Contractor JV HMG
Demographics						
1. Project Construction	Concentration of approx. 3,500 project work force; displacement of approximately 144 households	H	L	S	Site camps near workplaces & at a distance from indigenous settlements; Rehabilitation programme; Rural development & training programme compensation	JV HMG/Project HMG/Project
2. Permanent NEA Camps	Permanent NEA staff of appox. 203; development of larger economic center resulting in increased population	M	L	L	None required None feasible	
3. Indirect Impact	Influx of 2-3000 job seekers & small entrepreneurs; uncontrolled settlement	M	L	S	Regulation of settlement on public and private land	HMG

Table 2.2.1 IMPACT PREDICTION OF ARUN III HYDRO PROJECT (3/3)

Resource/ Project Activity	Impacts	Magnitude	Extent	Duration	Mitigation	Responsibility
Socio-economic & Cultural						
1. Project Construction	Loss of arable land;	H	L	L	Intensify production on remaining land; Reclaim arable land after construction	HMG/Project JV/contractor
	Displacement of approx. 144 families; interruption of normal farming activities	H	L	L	Minimise project land requirements; Compensation & rehabilitation programme; Intensify production on remaining land; Provide skill training for employment on construction;	HMG/Project JV/contractor HMG/Project HMG/Project Contractor
	Requirement for additional food for local people & workforce & immigrants;	M	L	S	Encourage production of crops & livestock products for sale to workforce and other outlets; Contractor to provide logistics for his work force;	HMG/Project JV/contractor
	Distruption of traditional social & cultural patterns by large scale immigration	M	L		Training and strenthening of villages; Limited work contracts for non-indigeneous labour.	HMG/Project JV/contractor

Legend : Magnitude
H = High
M = Moderate

Extent
L = Local

Duration
L = Long term (Over 20 years)
M = Medium term (Over 10 years)
S = Short term (Below 10 years)

JV : Joint Venture Arun III
DOR : Department of Roads
SWK : Scott Wilson Kirkpatrick (Road Consultant)
NEA : Nepal Electricity Authority

Source : National Environmental Impact Assessment Guidelines, 1991 (Draft) IUCN

Table 2.3.1 SOIL AND WATER CONSERVATION MEASURES (1/2)

1. Preventive measures

   - On-farm Conservation :
     - terrace improvement
     - farm waterways protection
     - shelterbelt development
     - horticulture and fodder plantation development

   - Forest development and management :
     - production forest development and management
     - protection forest development and management

   - Shrubland and grassland management :
     - shrubland management
     - range or silvo-pastral management
     - reclamation of degraded lands

   - Settlement site services :
     - community water source development and protection
     - water conservation pond development
     - greenbelt development

2. Rehabilitative measures

   - On hillslopes, including road embankments :
     - landslide treatment
     - degraded roadbank stabilization
     - degraded trail improvement
     - gully treatment
     - hill irrigation channel and drainage improvement

   - In valleys, including waterways :
     - torrent control
     - streambank treatment
     - irrigation channel and drainage improvement

3. Conservation education and extension

   Education
   - proper and inproper land use
   - knowledge of how to solve conservation problems when recognized

Table 2.3.1 SOIL AND WATER CONSERVATION MEASURES (2/2)

Extension

- demonstration of the effectiveness and benefits of soil conservation and watershed management measures on farmer's land
- motivating people to participate in soil conservation and watershed management operations
- extending financial and technical support

Reducing pressure on the environment, namely reducing demand for fuelwood, food, fodder, thatching materials, timber, etc, and raising their productivity

- stall feeding
- introducing better cattle breeds
- proper land use practices
- use high yielding varieties and certified seeds
- proper fertilizer application
- improved stove use
- alternative energy sources, such as biogas, solar power, wind power, water mill, etc.

4. Others

- Other construction works and facilities which might induce the deterioration of watershed, such as road, irrigation canal, hydropower structure, must be carefully designed
- Population growth, which is the biggest pressure to the man-induced watershed deterioration, should be reasonably controlled
- Resettlement can help the population pressure above
- Establishment of a system to fight forest and grass fires
- Research work and basic information an watershed must be accumulated
- Institutional and administrative system which motivates people to afforestate and reforestate their land should be introduced, such as tax exception/reduction, etc.
- Training manpower/staff concerned

Source : Modified from "Master Plan for the Forestry Sector, Soil Conservation and Watershed Management Plan, Nepal 1988"

Table 2.3.2 DISTRICT WATERSHED EVALUATION

Project	District	Numerical Value*	Evaluation*	Area (km2)**	Agri. Land** use (km2)	Forest (km2)**	Pop./Area (km2)	Pop./Agri. Land (km2)	Pop./Forest (km2)	Population 1991***	Population 1981****	Pop. Growth Ratio/year
BR - 1	Surkhet	5,118	Very poor	2,490	666	1,779	90	338	127	225,296	166,196	3.10%
	Salyan	1,294	Good	1,501	700	796	121	260	229	182,145	152,063	1.80%
	Jajarkot	1,036	Good	2,222	682	1,356	51	168	84	114,267	99,312	1.40%
CR - 2	Darchula	823	Good	2,330	862	795	44	118	128	101,614	90,218	1.20%
	Baitadi	1,449	Good	1,487	697	787	135	287	254	200,229	179,136	1.10%
SR - 3	Bajhang	1,159	Good	3,476	946	1,132	40	147	123	139,178	124,010	1.20%
LR - 1	Dailekh	1,544	Marginal	1,501	704	781	125	267	240	187,820	166,527	1.20%
Whole Nepal				147,485	21,033	62,955	125	878	293	18,462,081	15,022,839	2.08%

Source :

* : Shresta B. D. et al. Watershed Condition of Districts of Nepal 1983.

** : Land Utilization Report, LRMP, 1986

*** : Statistical Pocket Book, Nepal 1992

**** : Population Census-1981, Nepal

Table 3.2.1 LEGEND FOR LAND UTILIZATION MAPS (1/2)

LAND-USE LEGEND

TERAI CULTIVATION

Wet Lands . . . . . W
Dry Lands . . . . . .D
Mixed Lands X

HILLSLOPE CULTIVATION

Level Terraces ..... T
Sloping Terraces C
Intense : 75% - 100% cultivated 3
Medium: 50% - 75% cultivated 2
Light : 25% - 50% cultivated 1
Abandonned ..... A

VALLEY CULTIVATION

Valley floors, Including Tars, Footslopes and/or Alluvial Fans which are too small to map V
Tars, Alluvial Fans and/or lower Footslopes ..... F

GRAZING LANDS

. . . . G

Sub Tropical Zone	<1000m	 1
Warm Temperate Zone	1000m -2000m	 2
Temperate Zone	2000m -2600m	 3
Cool Temperate Zone	2600m -3000m	 4
Sub - Alpine Zone	3000m -4000m	 5
Alpine Zone	>4000m	 6

NON AGRICULTRAL LANDS

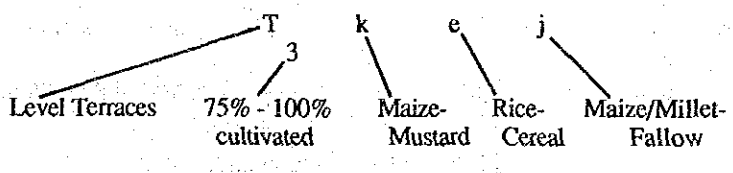
Perpetual Snow and Ice I
Rock ..... R
Sand/Gravel/Boulders ..... B

MOST DOMINANT CROPPING PATTERNS

MONSOON SEASON	WINTER/DRY SEASON	
Rice	Fallow	a
Rice	Cereal, Oilseed	b
Rice	Pulses	d
Rice	Cereal	e
Rice + Maize	Wintercrop	h
Maize / Millet	Fallow	j
Maize	Mustard	k
Maize	Cereal	l
Cereal	Fallow	n
Cereal-Fallow	Fallow-Fallow	q
Pigeon Peas		p
Mixed		m

Upland rice - underlined (. . . e)

TYPE LEGEND SAMPLE



Land-Use Boundary . . . . . _____

Table 3.2.1 LEGEND FOR LAND UTILIZATION MAPS (2/2)

FORESTRY LEGEND

COVER TYPE

C - Coniferous - 75% or more of tree species are coniferous
H - Hardwood - 75% of tree species are broad leaved hardwoods
M - All other combinations of tree species (3 metres ht)
S - Shrub; shrub vegetation which may include broadleaved hardwood regeneration

SPECIES TYPE

Tropical

Sal - Shorea robusta
KS - Acacia catechu and Dalbergia sissoo -
Pr - Pinus roxburgii (Chir Pine)
TMH Tropical mixed hardwoods

Temperate and Alpine

Hardwood-DMB - Decidious mixed broadleaved
Q - Quercus (Oak) all species
Bu - Betula utilis (Birch)
A - Abies spectabilis and A pindrow (Fir)
Pw - Pinus wallichiana (Blue Pine)

Species of interest which may form a minor or infrequent component within a major type will be shown as subsript in lower case species abbreviation.

pw - Pinus wallichiana (Blue Pine)
td - Tsuga dumosa (Hemlock)
ct - Cupressus torulosa (Cypress)
jw - Juniperus wallichiana (Juniper)
ce - Cedrus deodara (Cedar)
c - Conifers present in hardwood mix
d - Degraded caused by heavy lopping of trees for fodder.
sp - Picea smithiana (spruce)

If stand is pure, only one species noted; if stand is mixed two species will be noted i.e. A Pw - Abies stand with Pinus, in order of predominance where possible.

CONDITION TYPES

Rock - Rock or Rock outcrop with scattered trees.
----> - Slide and slips - arrow indicates downslope direction.
Br - Burn - area of burn leaving little or no residual stand.
Pl - Plantation.
PF - Protection Forest - area with slopes in excess of 30^{o} and /or because of erosion condition and/or lack of commercial value.

CROWN DENSITY

Expressed as a percentage of the area covered by tree crowns.

1. <10%
2. 10 - 40%
3. 40 - 70%
4. >70%

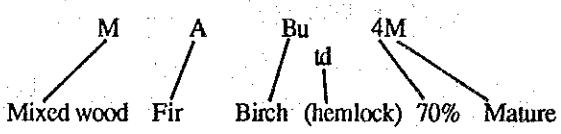
MATURITY CLASS

M - Mature (to overmature) - trees have reached at least estimated rotation stage-Saw timber size.

I - Immature - small timber size material.

R - Reproduction - new regeneration to pole size.

TYPE LEGEND SAMPLE



Forestry Boundary . . . . . _____

Table 3.3.1 PRESENT WATERSHED CONDITION OF SURKHET STRATEGIC AREA'S DISTRICT (1/2)

1. Name of District	SURKHET	
2. Present Watershed Condition of District		
2.1 Population of District	220,00 People, 37,000 Households According to 1991 population census	
2.2 Agricultural Production as of 1991		
(1) Major Crops	paddy, Area 12,515 ha, Yield 2,264 kg/ha maize, Area 14,520 ha, Yield 1,825 kg/ha wheat, Area 16,900 ha, Yield 1,425 kg/ ha	
(2) Major Market	Name : Bidhapur, Distance 40 Km One and half day Walk	
(3) Availability of Irrigation	Yes 4,000 ha	
(4) Livestock	Cow + ox	178,158 Head
	Buffaloes	59,740 Head
	Goats	151,680 Head
	Pig	7,869 Head
(5) Horticultural Tree Crops	Mango & Orange , Area 107 ha	
(6) Types of Forest	Hardwood, Area	33,781 ha
	Mixed Hardwood, Area 21,206 ha	
	Coniferous, Area	31,468 ha
	Mixed	20,320 ha
2.3 Major Tree Species	Hardwood : Sal & Oak forest	
	Mixed hardwood : Terminalie spp, Adind spp, Albezzia, woodforchia spp	
	Coniferous : Chirpine	
	Mixed hardwood & Coniferous forest : Sal, Chirpine, oak, pine	
2.4 Consumption of Firewood	Kind : Sal, Chirpine, Oak, Terminalia, Albezzia etc. Total consumption : 10 kg/day/household	
2.5 Shrinkage of Forest Area		
Difference of Last 12 Years		
Frequency of firewood collection	4 times/week	4 times/week in 1992
Time consumed/collection	12 Hrs	28 Hrs in 1992
2.6 Landslide occurence in 1990	No occurrence	

Table 3.3.1 PRESENT WATERSHED CONDITION OF SURKHET STRATEGIC AREA'S DISTRICT (2/2)

3. Afforestation/Reforestation Plan of MFE

3.1 Location	Achievement in 1991			
	Latikoili : 40 ha, Tree species : Melia spp, Chirpine, Auriculas, Chrospondis akiliries etc			
	Bidhapur : 15 ha, Tree Species : Chirpine, Auriculas spp Melia spp. etc			
	Future Plans			
	1992	100 ha,	Tree species :	Chispine, Auriculas
	1993	125 ha,	Tree species :	Chrospondis, Melia
	1994	150 ha,	Tree species :	Sissoo, Acasia etc.
	1995	150 ha,	Tree species :	Eucaliptus etc
3.2 Production of seedlings in 1991	Chirpine		150,000	Seedlings
	Auriculas spp		50,000	Seedlings
	Chrospondis spp		25,000	Seedlings
	Melia		50,000	Seedlings
	Others, fodder		33,000	Seedlings
		Total	308,000	Seedlings

Table 3.4.1 PRESENT WATERSHED CONDITION OF DIPAYAL-SILGADHI-RAJPUR STRATEGIC AREA'S DISTRICT (1/2)

1. Name of District	DOTI		
2. Present Watershed Condition of District			
2.1 Population of District	167,469 People, 25,464 Households		
2.2 Agricultural Production as of 1991			
(1) Major Crops	paddy, Aea	6,025 ha,	16,485 M.T
	maize, Area	4,200 ha,	8,772 M.T
	wheat, Area	10,350 ha,	11,876 M.T
(2) Major Market	Dipayal Silgadhi, Distance 8 km		
	One day walk		
(3) Availability of Irrigation	Yes		
	3,000 ha		
(4) Livestock	Buffalo	62,520 Head	
	Cow/Bull	135,710 Head	
	Goat	79,640 Head	
	Sheep	467 Head	
(5) Horticultural Tree Crops	Pear	27,122 trees	
	Orange	14,600 trees	
	Mango	3,100 trees	
	Plum	7,728 trees	
	Citrus	10,000 trees	
(6) Types of Forest	Sal	2,150 ha	
	Oak	26,208 ha	
	Pine	35,447 ha	
	Mixed	67,099 ha	
2.3 Major Tree Species	Chir-Pine, Sal, Oak		
2.4 Consumption of Firewood	Kind Quercus, Chir Pine, other broad leaves		
	Total consumptic	10 kg/day/household	
2.5 Shrinkage of Forest Area			
Difference of Last 12 Years			
Frequency of firewood collection	2 times/week	1 times/week in 1992	
Time consumed/collection	15 hrs	20 hrs in 1992	

Table 3.4.1 **PRESENT WATERSHED CONDITION OF DIPAYAL-SILGADHI-RAJPUR STRATEGIC AREA'S DISTRICT (2/2)**

3. Afforestation/Reforestation Plan of MFE

3.1 Location	Achievement in 1991	
	4.3.5 ha, Tree specie:	: Pinus, Roxburghii
		: Melia avedarache
	Future Plans	1992
	40 ha, Tree species	Timber
	20 ha, Tree species	Fuel wood
	10 ha, Tree species	Fodder
3.2 Production of seedlings in 1991	Fuelwood 180,000	Seedlin
	Fodder 125,000	Seedlings
	Fruit 35,000	Seedlings
	Multipurpc 10,000	Seedlings
	Timber 245,000	Seedlings

Table 3.5.1 PRESENT WATERSHED CONDITION OF BAITADI STRATEGIC AREA'S DISTRICT (1/2)

1. Name of District	BAITADI			
2. Present Watershed Condition of District				
2.1 Population of District	300,200 People, 35,225 Households According to 1991 population census			
2.2 Agricultural Production as of 1991				
(1) Major Crops	paddy , Area 11,050 ha maize , Area 12,800 ha wheat , Area 2,187 ha			
(2) Major Market	Baitadi 3 day of walk			
(3) Availability of Irrigation	Yes 485 ha			
(4) Livestock	Cow + ox	116,607	Head	
	Buffaloes	59,783	Head	
	Goats	68,727	Head	
(5) Horticultural Tree Crops	Orange	45,865	trees	
	Junar	33,004	trees	
	Okhar	23,030	trees	
	Lemon	13,980	trees	
(6) Types of Forest	Hardwood	13,886.3	ha	
	Conifer	28,306.6	ha	
	Mixed	18,606.9	ha	
2.3 Major tree species	Pinus roxburghii, Quercus Spp, Rhododendron Shorea robusta etc.			
2.4 Consumption of Firewood	Kind : Quercus, schima, pinus, sal etc. Total consumption : 12 kg/day/household			
2.5 Shrinkage of Forest Area				
(1) It is assumed that after the land survey forest area has decreased by 25%..				
(2) Difference of Last 12 Years				
Frequency of firewood collection	2 times/week		6 times/week in 1992	
Time consumed/collection	4 hrs		36 hrs in 1992	
2.6 Landslide occurence in 1990	Sigash VDC - 2, Chamrekhark Places			
	Extent		60	ha
	Damage	Cultivated land	15	ha
		Road	0	Place
		House	25	Houses
		Life lost	0	Person

Table 3.5.1 PRESENT WATERSHED CONDITION OF BAITADI STRATEGIC AREA'S DISTRICT (2/2)

3. Afforestation/Reforestation Plan of MFE

3.1 Location			At 5 VDC	Achievement in 1991 42 ha
	Malladehi	VDC-1	10 ha, Tree species : pinus, prunus, quereus	
	Basuling	VDC-1	10 + 4 ha, Tree species : pinus, Bakaino, prunus	
	Maharudhra	VDC-1	8 ha, Tree species : pinus, Bakaino, prunus	
	Bumeshwar	VDC-2	5.5 ha, Tree species : pinus, quereus spp	
	Patan	VDC-2	4.5 ha, Tree species : pinus, quereus spp	
			Future Plans :	120 ha
			In different VDC Tree species :	pinus, quereus
			Tree species :	Bakaino, Taki etc.

3.2 Production of seedlings in 1991	pinus rexburghii	Seedlings 180,000
Total seedlings produced	pinus excelsa	Seedlings 45,000
375,000	quercus spp + Fodder spp	Seedlings 150,000

3.3 Others/Remarks

3.4 Soil conservation and watershed office

Activities 1992

i) Terrace improvement	20 ha
ii) Water ways protection	6 numbers
iii) Horticulture/podder plantation	2.5 ha
iv) Silvo/pasture	4 ha
v) Green belt	4 km
vi) Land slide control	5 ha
vii) Conservation plantation	5 ha

Achievement of 1991

i) Plantation	5 ha
ii) Small gully control	1 number

3.5 Trends of rainfall and drought season of last 5 years

- It is known that rainfall is decreasing and drought is increasing. It is also seen that small streams and falls are drying

3.6 Factors affecting deforestation

- Increasing population
- No alternatives for fuelwood

3.7 Electricity Availability

- 620 households have electricity facility in Baitadi supplied by India
- One minihydroelectric power plant servicing at Patan

Table 4.1.1 RELEVANCE MATRIX FOR INITIAL ENVIRONMENTAL EXAMINATION OF THE BR-1 SCHEME (1/4)

Relevance Matrix for Initial Environmental Examination

Project : **BR-1**

Evaulation
- XX : Significant Impact
- X : Moderate Impact
- : Insignificant Impact

	ACTIVITIES	Potential Areas Affected	PHYSICAL				BIOLOGICAL		AESTHETIC						SOCIAL		
			WATER	NOISE	LAND	ATMOSPHERE	SPECIES AND POPULATIONS	HABITATS AND COMMUNITIES	LAND	ATMOSPHERE	WATER	FLORA AND FAUNA	MAN MADE OBJECTS	COMPOSITION	INDIVIDUAL ENVIRONMENTAL INTERESTS	INDIVIDUAL WELL-BEING	SOCIAL INTERACTIONS
Site Selection and Preparation	ACCESS ROAD		XX	XX	XX	XX	XX	XX	X	XX		X					
	SITE SURVEYING			XX												XX	X
	SOIL TESTING																
	HYDROLOGICAL TESTING																
	ENVIRONMENTAL SURVEY						X	X									
	SITE CLEARING		X	XX	XX	X	X	X	X	X		X					
	BURNING																
	EXCAVATION																
	DRAINAGE ALTERATION																
	STREAM CROSSING																
	EQUIPMENT																
	WASTE DISPOSAL AND RECOVERY																
	PRODUCT STORAGE																
Construction Stage	ACESS ROADS		XX	XX	XX		XX	XX				XX					
	SITE CLEARING (DEFORESTATION)		XX	X	XX	XX	XX	XX	X	X		XX					
	EXCAVATION		XX	XX	XX	XX	X	X	X	X		X					
	BLASTING AND DRILLING		X	X	X												
	DEMOLITION																
	BUILDING RELOCATION																
	CUT AND FILL		XX		X	XX			X								
	TUNNELS AND UNDERGROUND STRUCTURES		XX	XX	XX	XX			X	XX	XX						
	EROSION																
	DRAINAGE ALTERATION		XX			X	XX	XX				XX				XX	
	STREAM CROSSING																
	EQUIPMENT MOVEMENTS			XX		X	XX	XX				XX					
	LABOUR FORCE		XX			XX	XX	XX		X		XX					
	WASTE DISPOSAL		XX			X		X		X	X			XX			
	PRODUCT DISPOSAL																
	PRODUT STORAGE																
	ABANDONMENT																
	RECLAMATION																
	REFORESTATION				X	X			X	X		X		X	X		
	FERTILISATION																
	ANCILLARY TRANSMISSION LINES AND PIPELINES			XX	X	X	X	X		X							
Operation and Maintenance	FOREST CLEARING																
	EXCAVATION																
	SPOIL AND OVERBURDEN																
	BLASTING AND DRILLING																
	DREDGING		XX	XX		X	X	X								X	
	EQUIPMENT OPERATION			XX													
	OPERATIONAL FAILURES																
	ENERGY REQUIREMENTS																
	ENERGY GENERATION																
	AUTOMOBILE AIRCRAFT VESSEL MOVEMENT			XX		XX	X	X			X		X				
	PEDESTRIAN MOVEMENT														X	X	X
	UTILITIES																
	WASTE DISPOSAL AND RECOVERY																
	PRODUCT STORAGE																
	SPILLS AND LEAKS																
	EXPLOSIONS																
	DEICING SNOW REMOVAL AND DISPOSAL																
	PEST CONTROL																
	DUST CONTROL																
	ABANDONMENT																
Future and Related Activities	URBANISATION																
	INDUSTRIAL DEVELOPMENT																
	TRANSPORTATION																
	ENERGY REQUIREMENTS																

Table 4.1.1 RELEVANCE MATRIX FOR INITIAL ENVIRONMENTAL EXAMINATION OF THE LR-1 SCHEME (2/4)

Relevance Matrix for Initial Environmental Examination

Project : **LR-1**

Evaluation
xx : Significant Impact
x : Moderate Impact
: Insignificant Impact

	ACTIVITIES	Potential Areas Affected	PHYSICAL				BIOLOGICAL		AESTHETIC						SOCIAL		
			WATER	NOISE	LAND	ATMOSPHERE	SPECIES AND POPULATIONS	HABITATS AND COMMUNITIES	LAND	ATMOSPHERE	WATER	FLORA AND FAUNA	MAN MADE OBJECTS	COMPOSITION	INDIVIDUAL ENVIRONMENTAL INTERESTS	INDIVIDUAL WELL-BEING	SOCIAL INTERACTIONS
Site Selection and Preparation	ACCESS ROAD																
	SITE SURVEYING			X	X												
	SOIL TESTING																
	HYDROLOGICAL TESTING																
	ENVIRONMENTAL SURVEY																X
	SITE CLEARING		X	X	XX				X	X							
	BURNING																
	EXCAVATION																
	DRAINAGE ALTERATION																
	STREAM CROSSING																
	EQUIPMENT																
	WASTE DISPOSAL AND RECOVERY																
	PRODUCT STORAGE																
Construction Stage	ACESS ROADS																
	SITE CLEARING (DEFORESTATION)		XX	X	XX	X	X	X									
	EXCAVATION		XX	XX		X	X	X	X	X	X	X		X	X	XX	XX
	BLASTING AND DRILLING		XX	XX	XX	XX	X	X									
	DEMOLITION																
	BUILDING RELOCATION			X	X	X										X	X
	CUT AND FILL		XX	XX	XX	XX	X	X	X	X	X	X					
	TUNNELS AND UNDERGROUND STRUCTURES			X													
	EROSION																
	DRAINAGE ALTERATION		XX			X	XX	XX			XX					XX	
	STREAM CROSSING																
	EQUIPMENT MOVEMENTS			XX		X				X							
	LABOUR FORCE									X		X				XX	XX
	WASTE DISPOSAL		XX			X				X	X						
	PRODUCT DISPOSAL																
	PRODUT STORAGE																
	ABANDONMENT																
	RECLAMATION																
	REFORESTATION																
	FERTILISATION																
	ANCILLARY TRANSMISSION LINES AND PIPELINES																
Operation and Maintenance	FOREST CLEARING																
	EXCAVATION																
	SPOIL AND OVERBURDEN																
	BLASTING AND DRILLING																
	DREDGING		XX	X			X					X					
	EQUIPMENT OPERATION																
	OPERATIONAL FAILURES																
	ENERGY REQUIREMENTS																
	ENERGY GENERATION																
	AUTOMOBILE AIRCRAFT VESSEL MOVEMENT			X													
	PEDESTRIAN MOVEMENT																
	UTILITIES																
	WASTE DISPOSAL AND RECOVERY																
	PRODUCT STORAGE																
	SPILLS AND LEAKS																
	EXPLOSIONS																
	DEICING SNOW REMOVAL AND DISPOSAL																
	PEST CONTROL																
	DUST CONTROL																
	ABANDONMENT																
Future and Related Activities	URBANISATION																
	INDUSTRIAL DEVELOPMENT																
	TRANSPORTATION																
	ENERGY REQUIREMENTS																

Table 4.1.1 RELEVANCE MATRIX FOR INITIAL ENVIRONMENTAL EXAMINATION OF THE CR-2 SCHEME (3/4)

Relevance Matrix for Initial Environmental Examination

Project : **CR-2**

Evaluation
xx : Significant Impact
x : Moderate Impact
: Insignificant Impact

	ACTIVITIES / Potential Areas Affected	PHYSICAL				BIOLOGICAL		AESTHETIC						SOCIAL		
		WATER	NOISE	LAND	ATMOSPHERE	SPECIES AND POPULATIONS	HABITATS AND COMMUNITIES	LAND	ATMOSPHERE	WATER	FLORA AND FAUNA	MAN MADE OBJECTS	COMPOSITION	INDIVIDUAL ENVIRONMENTAL INTERESTS	INDIVIDUAL WELL-BEING	SOCIAL INTERACTIONS
Site Selection and Preparation	ACCESS ROAD	XX	XX	XX	XX											
	SITE SURVEYING		XX													
	SOIL TESTING															
	HYDROLOGICAL TESTING															
	ENVIRONMENTAL SURVEY													X	X	X
	SITE CLEARING	X	XX	XX				XX		X						
	BURNING															
	EXCAVATION															
	DRAINAGE ALTERATION															
	STREAM CROSSING															
	EQUIPMENT															
	WASTE DISPOSAL AND RECOVERY															
	PRODUCT STORAGE															
Construction Stage	ACESS ROADS	XX	XX	XX				X					X		X	
	SITE CLEARING (DEFORESTATION)															
	EXCAVATION	XX	XX			XX	XX								XX	
	BLASTING AND DRILLING	XX	XX	X	XX	XX										
	DEMOLITION															
	BUILDING RELOCATION			X												
	CUT AND FILL	XX	XX	XX				XX		X						
	TUNNELS AND UNDERGROUND STRUCTURES		XX	X												
	EROSION	XX			X	XX										
	DRAINAGE ALTERATION	XX		X		XX	XX									
	STREAM CROSSING															
	EQUIPMENT MOVEMENTS		XX		X										X	
	LABOUR FORCE				X				X						XX	X
	WASTE DISPOSAL								X	X						
	PRODUCT DISPOSAL															
	PRODUT STORAGE															
	ABANDONMENT															
	RECLAMATION															
	REFORESTATION															
	FERTILISATION															
	ANCILLARY TRANSMISSION LINES AND PIPELINES				X			X	X							
Operation and Maintenance	FOREST CLEARING															
	EXCAVATION															
	SPOIL AND OVERBURDEN															
	BLASTING AND DRILLING															
	DREDGING	XX	XX							X						
	EQUIPMENT OPERATION															
	OPERATIONAL FAILURES														X	
	ENERGY REQUIREMENTS															
	ENERGY GENERATION														X	
	AUTOMOBILE AIRCRAFT VESSEL MOVEMENT		XX		X											
	PEDESTRIAN MOVEMENT															
	UTILITIES															
	WASTE DISPOSAL AND RECOVERY															
	PRODUCT STORAGE															
	SPILLS AND LEAKS															
	EXPLOSIONS															
	DEICING SNOW REMOVAL AND DISPOSAL															
	PEST CONTROL															
	DUST CONTROL															
	ABANDONMENT															
Future and Related Activities	URBANISATION															
	INDUSTRIAL DEVELOPMENT															
	TRANSPORTATION															
	ENERGY REQUIREMENTS															

Table 4.1.1 RELEVANCE MATRIX FOR INITIAL ENVIRONMENTAL EXAMINATION OF THE SR-3 SCHEME (4/4)

Relevance Matrix for Initial Environmental Examination

Project : **SR-3**

Evaluation
xx : Significant Impact
x : Moderate Impact
: Insignificant Impact

ACTIVITIES	Potential Areas Affected	PHYSICAL				BIOLOGICAL		AESTHETIC						SOCIAL		
		WATER	NOISE	LAND	ATMOSPHERE	SPECIES AND POPULATIONS	HABITATS AND COMMUNITIES	LAND	ATMOSPHERE	WATER	FLORA AND FAUNA	MAN MADE OBJECTS	COMPOSITION	INDIVIDUAL ENVIRONMENTAL INTERESTS	INDIVIDUAL WELL-BEING	SOCIAL INTERACTIONS
Site Selection and Preparation	ACCESS ROAD															
	SITE SURVEYING		X	X												
	SOIL TESTING															
	HYDROLOGICAL TESTING															
	ENVIRONMENTAL SURVEY													X	X	X
	SITE CLEARING	XX	XX	X	X	XX	XX				X				X	
	BURNING															
	EXCAVATION															
	DRAINAGE ALTERATION															
	STREAM CROSSING															
	EQUIPMENT															
	WASTE DISPOSAL AND RECOVERY															
	PRODUCT STORAGE															
Construction Stage	ACESS ROADS	X	X	X												
	SITE CLEARING (DEFORESTATION)															
	EXCAVATION	XX	XX	X	X	XX	XX		X							
	BLASTING AND DRILLING	XX	XX	X	X	XX	XX									
	DEMOLITION															
	BUILDING RELOCATION			XX												
	CUT AND FILL	XX	XX	XX	X	X	X	X	X	X						
	TUNNELS AND UNDERGROUND STRUCTURES	XX	XX	X	X											
	EROSION															
	DRAINAGE ALTERATION	XX				X	X									
	STREAM CROSSING															
	EQUIPMENT MOVEMENTS		X		X											
	LABOUR FORCE				X				X							
	WASTE DISPOSAL	XX							X	X					XX	X
	PRODUCT DISPOSAL															
	PRODUT STORAGE															
	ABANDONMENT															
	RECLAMATION															
	REFORESTATION															
	FERTILISATION															
	ANCILLARY TRANSMISSION LINES AND PIPELINES															
Operation and Maintenance	FOREST CLEARING															
	EXCAVATION															
	SPOIL AND OVERBURDEN															
	BLASTING AND DRILLING															
	DREDGING	XX	XX							X						
	EQUIPMENT OPERATION															
	OPERATIONAL FAILURES														X	
	ENERGY REQUIREMENTS															
	ENERGY GENERATION															
	AUTOMOBILE AIRCRAFT VESSEL MOVEMENT		XX		X											
	PEDESTRIAN MOVEMENT															
	UTILITIES															
	WASTE DISPOSAL AND RECOVERY															
	PRODUCT STORAGE															
	SPILLS AND LEAKS															
	EXPLOSIONS															
	DEICING SNOW REMOVAL AND DISPOSAL															
	PEST CONTROL															
	DUST CONTROL															
	ABANDONMENT															
Future and Related Activities	URBANISATION															
	INDUSTRIAL DEVELOPMENT															
	TRANSPORTATION															
	ENERGY REQUIREMENTS															

Table 4.1.2 ENVIRONMENT SURVEY RESULTS (1/2)

Factors	BR-1	CR-2	SR-3	LR-1
1. Social Environment				
(1) Population affected				
No. of villages	Hariharpur VDC	5,6 houses (Ganna Bari)	Chainpur, Deval	4 (Chupra, Khaitara, Khara, Sandhu)
Mother tongue	Nepali	Nepali (Darchula dralect)	Nepali (Bajhangi dialect)	Nepali
Extent of people's area of activity (markets, etc.)	Surkhet, 6 hours	Jhulaghat 1 day	Dadeldhura 3 days Doti 2 days	Surkhet 12 hrs. of walk
(2) Industry				
Fishery				
No. of Fishermen	some houses	Not specific	Not specific	Not speific
Migration of Fish	upstream during monsoon			Small number in monsoon from Karnali
Fishing season	March - June / Aug - sept	All year	All year	Monsoon
Agriculture				About 25 bigha in Barah Chaur, 12 bigha
Inundated arable land	almost none	if any, very small area	Small area	in Chupra, small patches in other villages
Mining	no	no	no	no
Tourism	no	no	no	(enroute to Dailekh from Surkhet)
Others	no	no	Wood works	None
(3) Transporatation				
Bridges	Suspension bridge	None	One	2 (Suspension) 1 - Lohore 1 - Chhan Gad
Road	Surkhet - Rajapur Trail	None	Trails only (Chainpur - Dadeldhura)	
Inland Navigation	Rafting by Tiger Tops	None	None	Not possible
Frequency of people's river crossing	25 people a day			
(4) Historical assets inundated ?	None	none	None	2 temples newly constructed None historical
(5) Sanitation				
Water-borne diseases				
types	Gastroentretis, Typhoid etc.	Gastroentretis to some extent	Gastsoentretis, typhoid etc.	Gastroentretis to some extent
frequency	every year rainy season	rainy season	3-4 months in a year (July - Sept.)	June / July / August
Water source for drinking				
Well, river, water tap	Bheri river and tributaries	Small streams for drought periods, river	Springs in high mountains (Dhami Lek)	
Is this located higher in altitude than the river ?	Yes if tributaries	yes	Yes	Yes
Is this source permanent or does it dry up in summer ?	Yes, permanent	in dry season very less to nil	Permanent	Yes, permanent
Distance from house to water source		500 - 1000m	Taps in corners of lanes	100 ~ 400m
Fetching time	1/2 hour	15min - 1/2 hour	Morning and Evening	15 ~ 30 mins.
Fetching frequency	morning and evening, twice a day	morning and evening	For washing most people go to river	mostly two times in a day

Table 4.1.2 ENVIRONMENT SURVEY RESULTS (2/2)

Factors	BR-1	CR-2	SR-3	LR-1
(6) Water right				
Usage of river water downstream				
Irrigation	from tributary, Pakma khola	None	SHIP irrigation schemes	None
Water mill	none on the main stream	6	3 ~ 4	1 ~ 2
Others	-	-	-	-
Do they have serious problem when drought ?	No	No	No	No
(7) Activities in Watershed				
Terraced land				on both .....
annual crops	Paddy, Maize, Wheat, Barley	Rice, Wheat, Maize, Sugercane	Rice, Maize and Wheat, Barley	Paddy, Wheat, Maize, Millet
tree crops	Lemon, Citrus fruits	Orange, Guava, Peach, etc	Pine	Growth on Slope sides
Grazing	not fixed, forest areas	not fixed	No fixed pasture land	Not fixed
Forest	no community type forest but some natural forest	none	3-4 small areas around Chainpur village on hills, now plantations done about 5 years back.	Scattered trees of Sal, Sails, Kapok on hills,
2. Natural Environment				
(1) Fauna				
Major animals	Deer, Wild Boar etc.	Domesticated animals only	Deer, Bear, Leopard, Tiger in high attitude forests.	Domesticated animals only
Major birds	Common birds only	Common birds only	Pheasants, Lopophorus (comes down during svare winter)	Not specific (crows, swallows, pigeons, and common birds)
(2) Flora				
Important plants	Sal , Sissoo	Fruit trees, some pine species	Various species of Pine	Sal, Pine species, Kapok, Simal

Table 4.2.1 RELEVANCE MATRIX FOR INITIAL ENVIRONMENTAL EXAMINATION OF THE BHERI-BABAI IRRIGATION SCHEME

Relevance Matrix for Initial Environmental Examination

Project : **Bheri-Babai Irrigation**

Evaluation
xx : Significant Impact
x : Moderate Impact
: Insignificant Impact

	ACTIVITIES	Potential Areas Affected	PHYSICAL				BIOLOGICAL		AESTHETIC						SOCIAL		
			WATER	NOISE	LAND	ATMOSPHERE	SPECIES AND POPULATIONS	HABITATS AND COMMUNITIES	LAND	ATMOSPHERE	WATER	FLORA AND FAUNA	MAN MADE OBJECTS	COMPOSITION	INDIVIDUAL ENVIRONMENTAL INTERESTS	INDIVIDUAL WELL-BEING	SOCIAL INTERACTIONS
Site Selection and Preparation	ACCESS ROAD																
	SITE SURVEYING			XX											X	X	X
	SOIL TESTING																
	HYDROLOGICAL TESTING																
	ENVIRONMENTAL SURVEY						X	X									
	SITE CLEARING																
	BURNING																
	EXCAVATION																
	DRAINAGE ALTERATION																
	STREAM CROSSING																
	EQUIPMENT																
	WASTE DISPOSAL AND RECOVERY																
	PRODUCT STORAGE																
Construction Stage	ACESS ROADS		XX	XX	XX	XX	XX	XX	XX	X							
	SITE CLEARING (DEFORESTATION)				XX	XX	X	XX	XX	X		XX					
	EXCAVATION		XX	XX	XX	XX	X	X	X	X	X	X	XX			XX	
	BLASTING AND DRILLING																
	DEMOLITION																
	BUILDING RELOCATION				XX											XX	
	CUT AND FILL		XX	XX	XX				X	X	X		XX		X	XX	
	TUNNELS AND UNDERGROUND STRUCTURES																
	EROSION																
	DRAINAGE ALTERATION		XX	X	XX	X			X	X	X		XX				
	STREAM CROSSING																
	EQUIPMENT MOVEMENTS		X	XX	X	X			X	X	X						
	LABOUR FORCE		XX			XX	XX	XX		X		X			X	XX	XX
	WASTE DISPOSAL		XX			X		X		X	X						
	PRODUCT DISPOSAL																
	PRODUT STORAGE																
	ABANDONMENT																
	RECLAMATION																
	REFORESTATION																
	FERTILISATION																
	ANCILLARY TRANSMISSION LINES AND PIPELINES																
Operation and Maintenance	FOREST CLEARING																
	EXCAVATION																
	SPOIL AND OVERBURDEN																
	BLASTING AND DRILLING																
	DREDGING		XX	X	X	X										X	
	EQUIPMENT OPERATION																
	OPERATIONAL FAILURES																
	ENERGY REQUIREMENTS																
	ENERGY GENERATION																
	AUTOMOBILE AIRCRAFT VESSEL MOVEMENT																
	PEDESTRIAN MOVEMENT																
	UTILITIES																
	WASTE DISPOSAL AND RECOVERY																
	PRODUCT STORAGE																
	SPILLS AND LEAKS																
	EXPLOSIONS																
	DEICING SNOW REMOVAL AND DISPOSAL																
	PEST CONTROL		X			X	X								X	X	
	DUST CONTROL																
	ABANDONMENT																
Future and Related Activities	URBANISATION																
	INDUSTRIAL DEVELOPMENT																
	TRANSPORTATION																
	ENERGY REQUIREMENTS																

Table 4.2.2 QUESTIONNAIRE RESULT OF IRRIGATION AREA

	Resettler	Non-resettler
1. Socio-economy		
(1) If settlement		
Name of settlement	Jamuni-Sitapur village	
Population of the settlement	340 Houses	
When did you come ?	1971	
From where did you come ?	Gorkha	
Implementing agency	Nepal Resettlement Company	
Programme detail :		
land provided	2 ha	
house		
food	No	
education	No	
loan etc.	Loan for 2 oxen; Duration for first 9 months	
Any conflict with the host people ?	No	
(2) If not resettlement		
Name of village		Lathawa (Sauraha VDC)
Population		100
Name of ethnic group		
Land holding system		Vishokarma
Own farm		0.17 - 0.34 ha
Lease holder		0.68 - 1.36 ha
(3) For both cases		
Agricultural extension service	Only for cotton cultivators	No
Are farm inputs available ?	Available, but use is minimal	Available, but not used
Fertilizer	Urea for wheat	
Pesticide	Not used	
Seed	Not popular	
How do you sell your farm products ?	Local Market of Khajura, Nepalgunj	Home consumption only
Yield of Major crops		
Rice	3.7 - 4.4 t/ha	2.9 - 3.7 t/ha
Barley	1.5 - 2.9 t/ha	1.5 - 1.8 t/ha
Maize	2.2 t/ha	1.5 - 1.8 t/ha
2. Water-borne Diseases		
Types	Cholera, Meningitis, Malaria	Cholera, Typhoid, Malaria
Season	Rainy season	May - August
3. Water-right		
Drinking Water Source	Tubewell	Tubewell
Irrigation	Private pump from Babai river	
4. Source of Fuel	Rice husk, hay, cowdung firewood	Rice husk, hay, cowdung firewood
5. Food damage		
Any damage ?	Bank cutting of main river	No
If any, how often	Flood time	
6. Others		
Extent of people's activities	Khajura, Nepalgunj	Khajura, Nepalgunj
Main transportation	Cart-Trail from Nepalgunj-Gulariya road	Nepalgunj-Gulariya road

Table 5.1.1 POPULATION AND ITS DENSITY OF VILLAGE DEVELOPMENT COMMITTEES IN THE RIVER BASIN OF LR-1 SCHEME

Name of VDC	Population in 1991 persons	Area km2	Population Density persons/km2
Baluwatar	2,615		
Raniban	3,504		
Bansi	3,355		
Kali Kathum	4,233		
Total of above four VDC	13,707	135.6	101.1
Duwari	2,286	55.8	41.0
Noumule	1,639	93.1	17.6
Mehaltari	1,883	79.9	23.6
Katti	4,211	51.0	82.6
Lakuri	3,226	27.4	117.7
Belpata	1,800	42.5	42.4
Paghnath	2,037	38.8	52.5
Salleri	3,278	35.0	93.7
Toli	2,501	15.1	165.6
Belashpur	2,761	35.9	76.9
Raniban	3,504	29.8	117.6
Khairi Gaira	3,189	38.3	83.3
Tribeni	2,868		
Basantmala	2,555		
Total of above two VDC	5,423	32.1	168.9
Narayan (District HQ)	3,615	6.6	547.7
Saraswati	3,815	22.7	168.1
Rawakot	4,041	20.8	194.3
Gamudi	2,948	17.5	168.5

Notes :

(1) A part of Kusapani, Bhairi Kalikathum, Badalmji, Syaulekadh, Dulla, Pusakot, Gouri and Danda Parajul VDC areas is also included in the river basin of LR-1 scheme.

(2) The VDCs of Baluwatar, Raniban, Bansi and Kali Kathum and of Tribeni and Basantmala are treated as one area in this study.

FIGURES

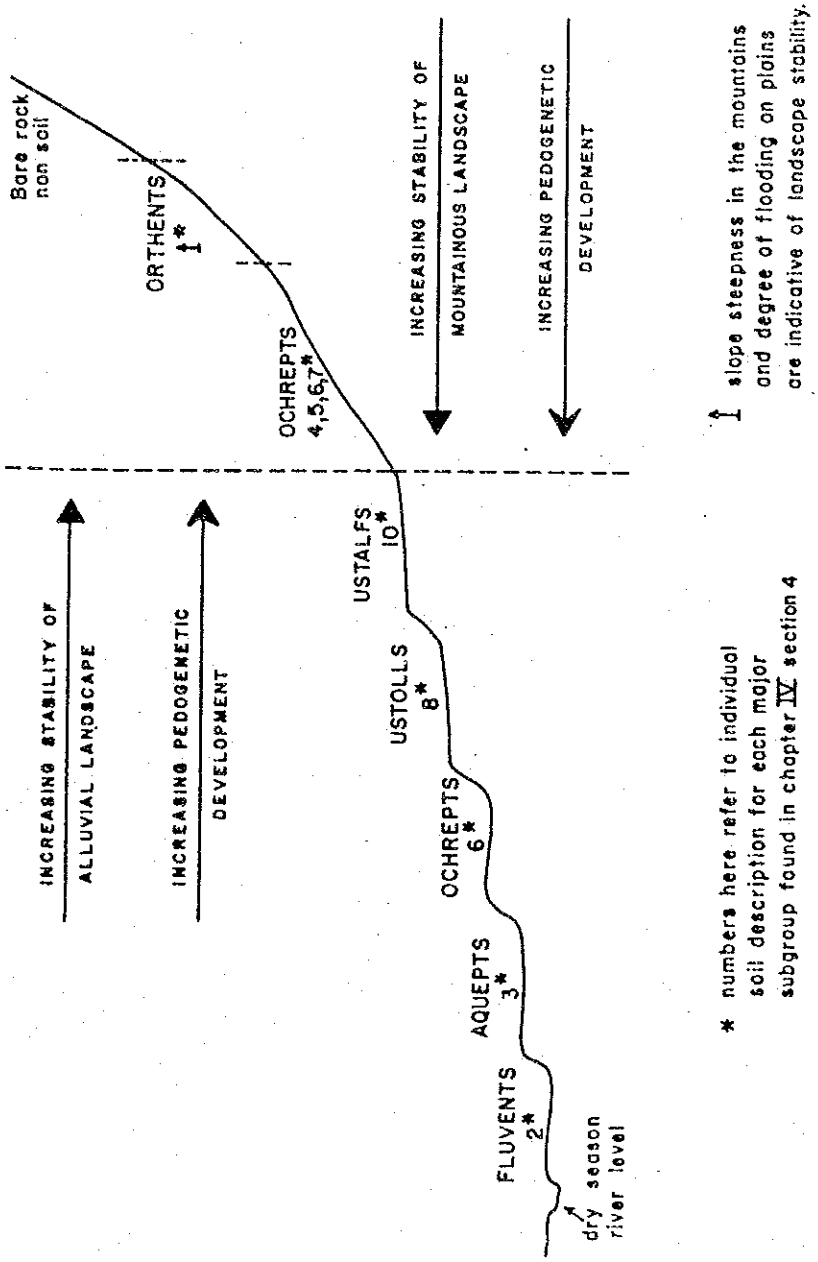


Figure 1.1.1 Schematic Diagram Showing the Relationship of Soil Great Groups of Nepal to Past Landscape Stability

HIS MAJESTY'S GOVERNMENT OF NEPAL
WATER RESOURCES DEVELOPMENT OF
THE UPPER KARNALI RIVER AND MAHAKALI RIVER BASINS
JAPAN INTERNATIONAL COOPERATION AGENCY

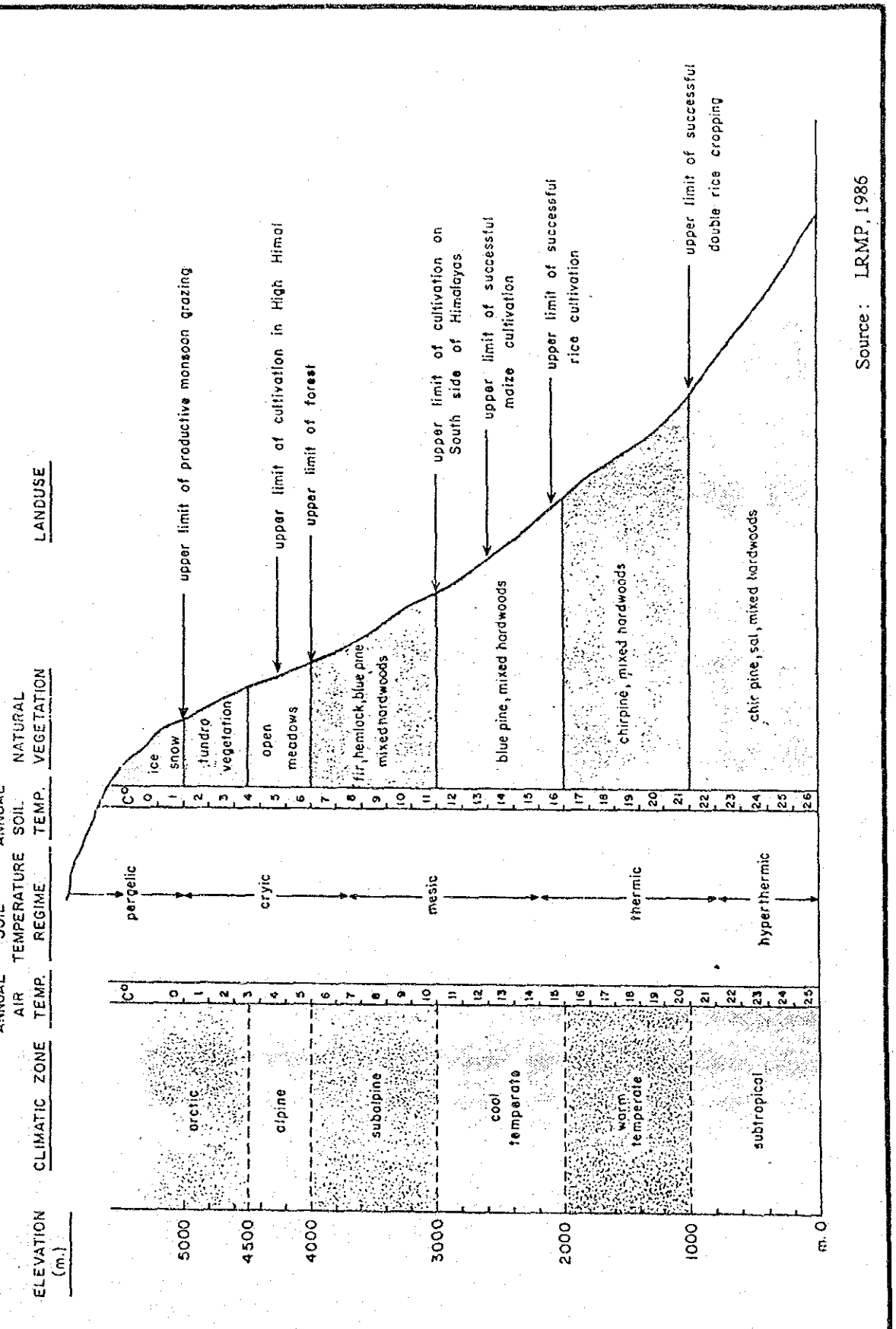


Figure 1.1.2

Relationship between Elevation / Climatic Zones, Temperature, Vegetation and Land Use Limits

HIS MAJESTY'S GOVERNMENT OF NEPAL
WATER RESOURCES DEVELOPMENT OF
THE UPPER KARNALI RIVER AND MAHAKALI RIVER BASINS
JAPAN INTERNATIONAL COOPERATION AGENCY

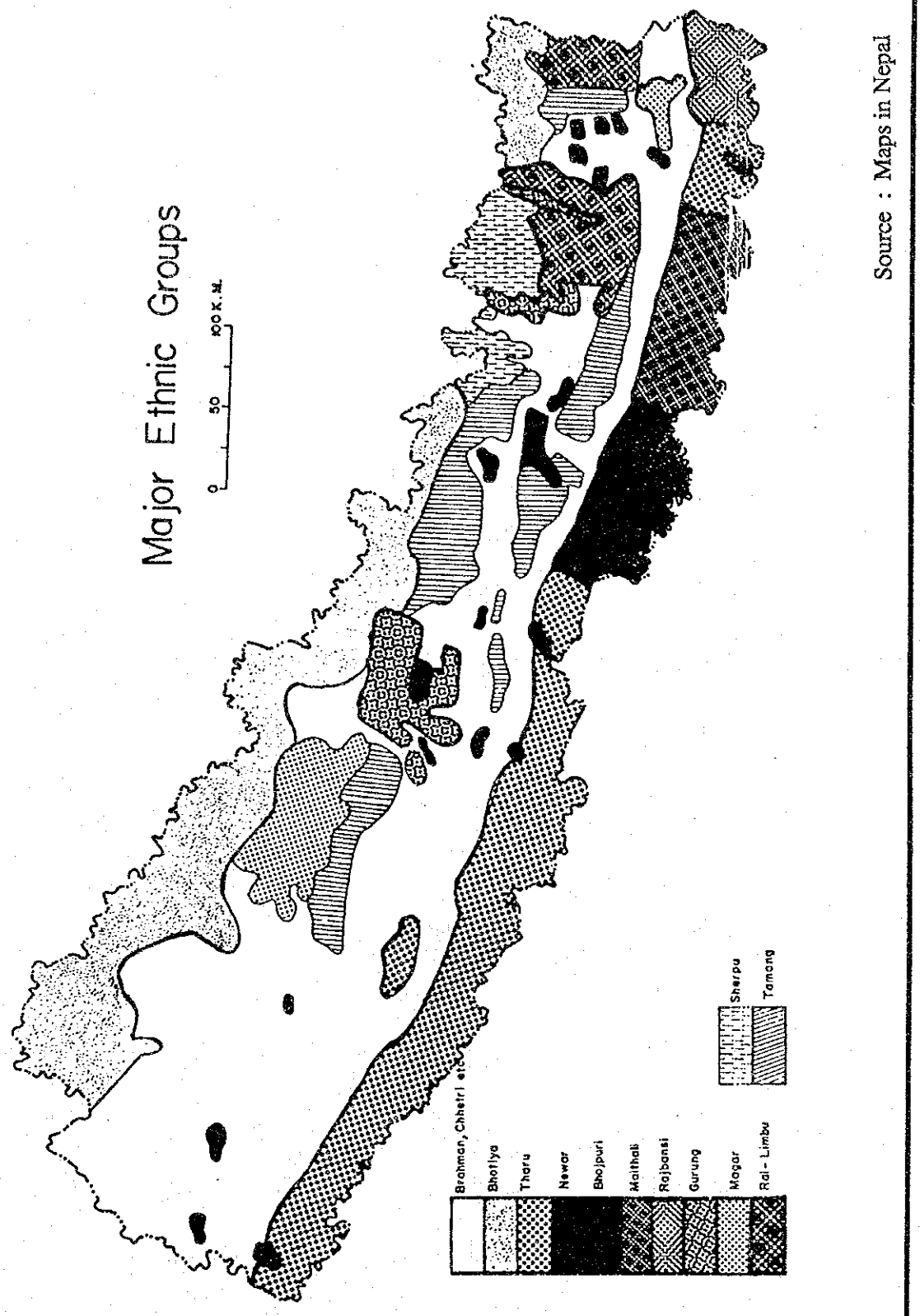


Figure 1.2.1 Major Ethnic Groups

HIS MAJESTY'S GOVERNMENT OF NEPAL
WATER RESOURCES DEVELOPMENT OF
THE UPPER KARNALI RIVER AND MAHAKALI RIVER BASINS
JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 1.2.2

Locations of Historical and Cultural Heritages

HIS MAJESTY'S GOVERNMENT OF NEPAL
WATER RESOURCES DEVELOPMENT OF
THE UPPER KARNALI RIVER AND MAHAKALI RIVER BASINS
JAPAN INTERNATIONAL COOPERATION AGENCY

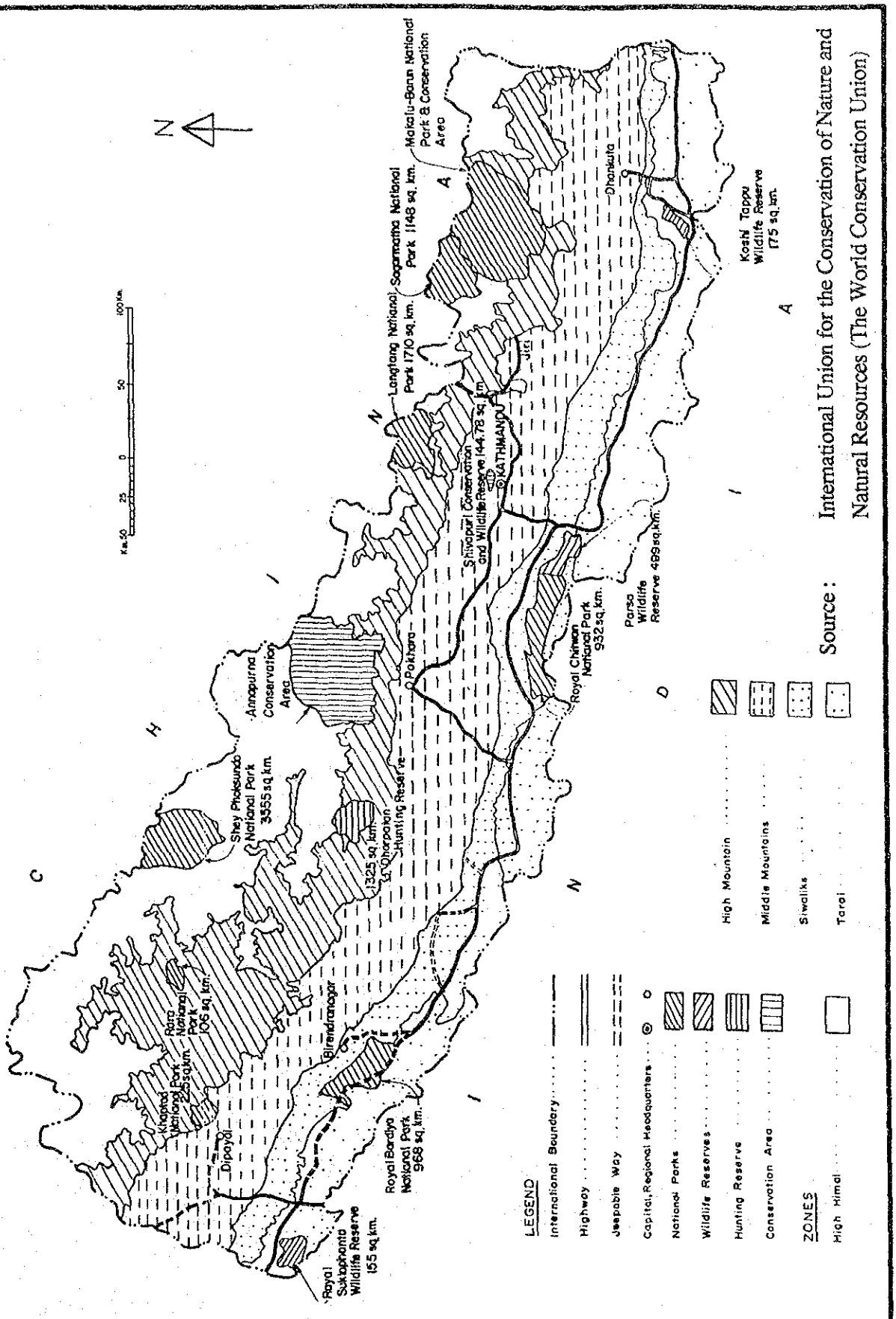


Figure 1.3.1
Protected Areas in Relation to the Physiographic Zone of Nepal

HIS MAJESTY'S GOVERNMENT OF NEPAL
WATER RESOURCES DEVELOPMENT OF
THE UPPER KARNALI RIVER AND MAHAKALI RIVER BASINS
JAPAN INTERNATIONAL COOPERATION AGENCY

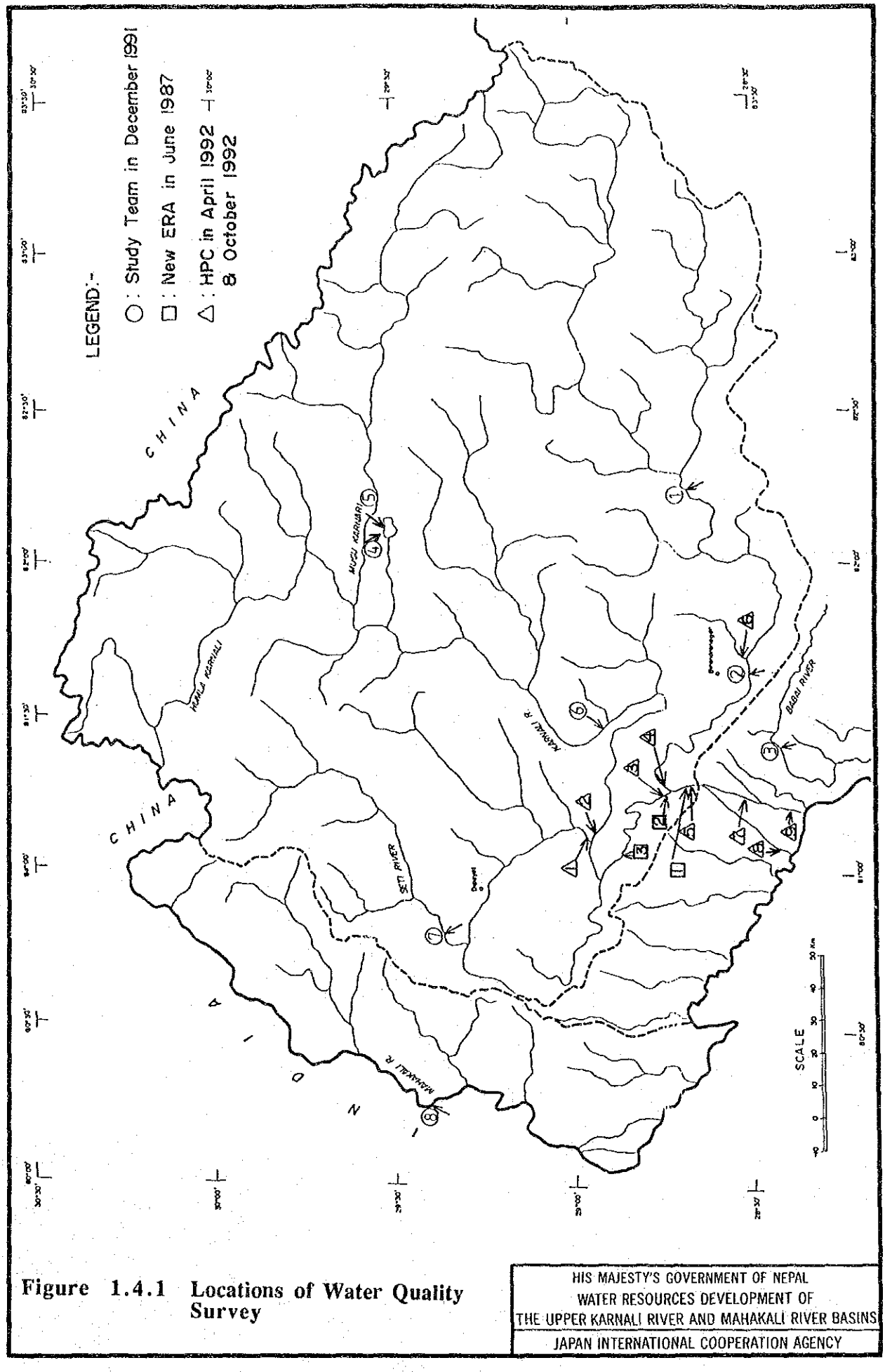


Figure 1.4.1 Locations of Water Quality Survey

HIS MAJESTY'S GOVERNMENT OF NEPAL
WATER RESOURCES DEVELOPMENT OF
THE UPPER KARNALI RIVER AND MAHAKALI RIVER BASINS
JAPAN INTERNATIONAL COOPERATION AGENCY

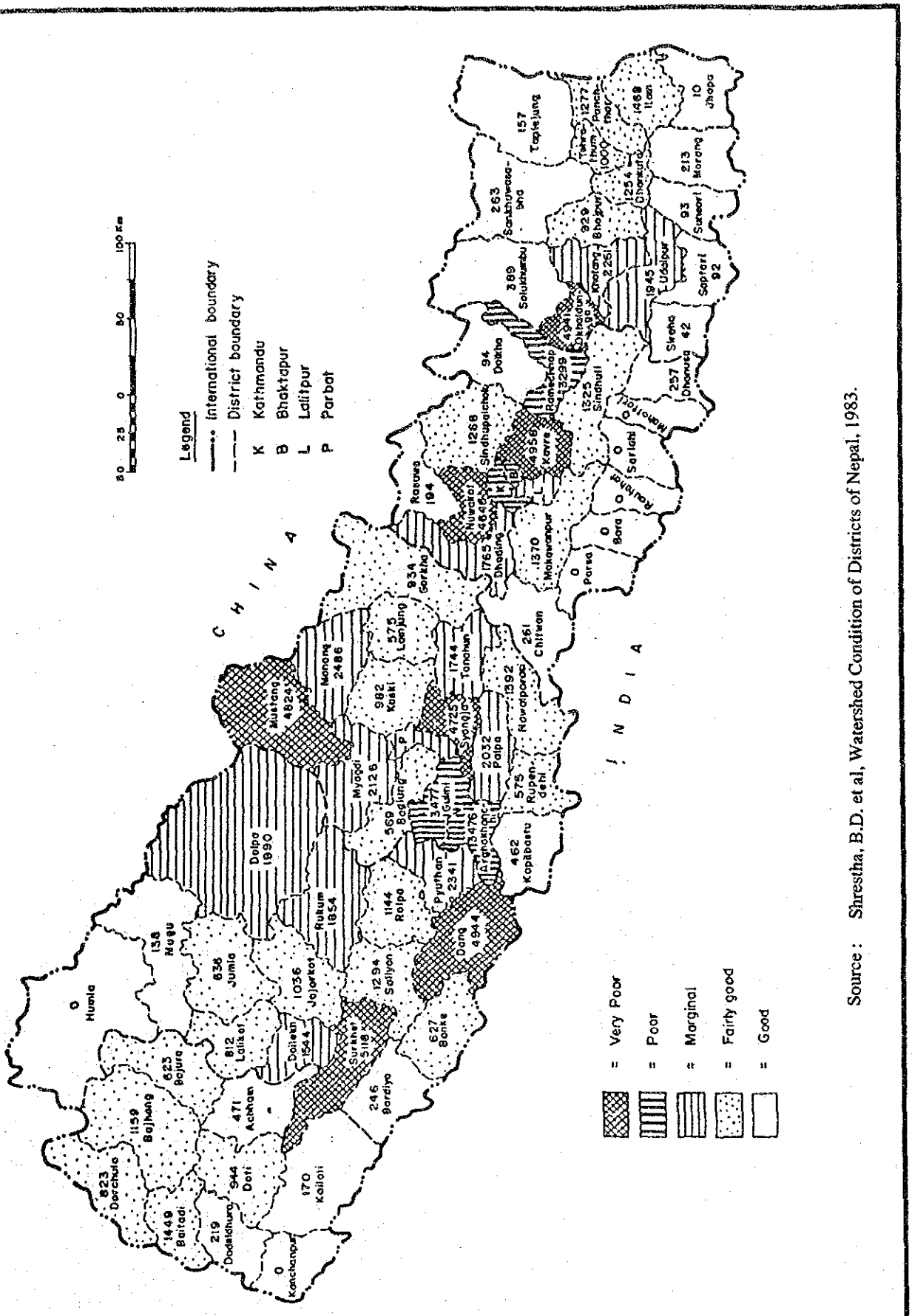


Figure 1.6.1 Watershed Condition by District

HIS MAJESTY'S GOVERNMENT OF NEPAL
WATER RESOURCES DEVELOPMENT OF
THE UPPER KARNALI RIVER AND MAHAKALI RIVER BASINS
JAPAN INTERNATIONAL COOPERATION AGENCY

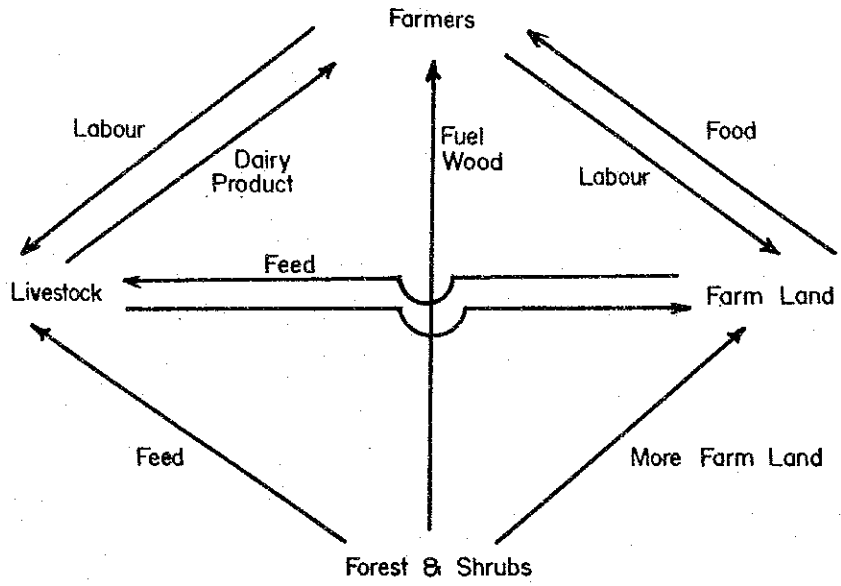
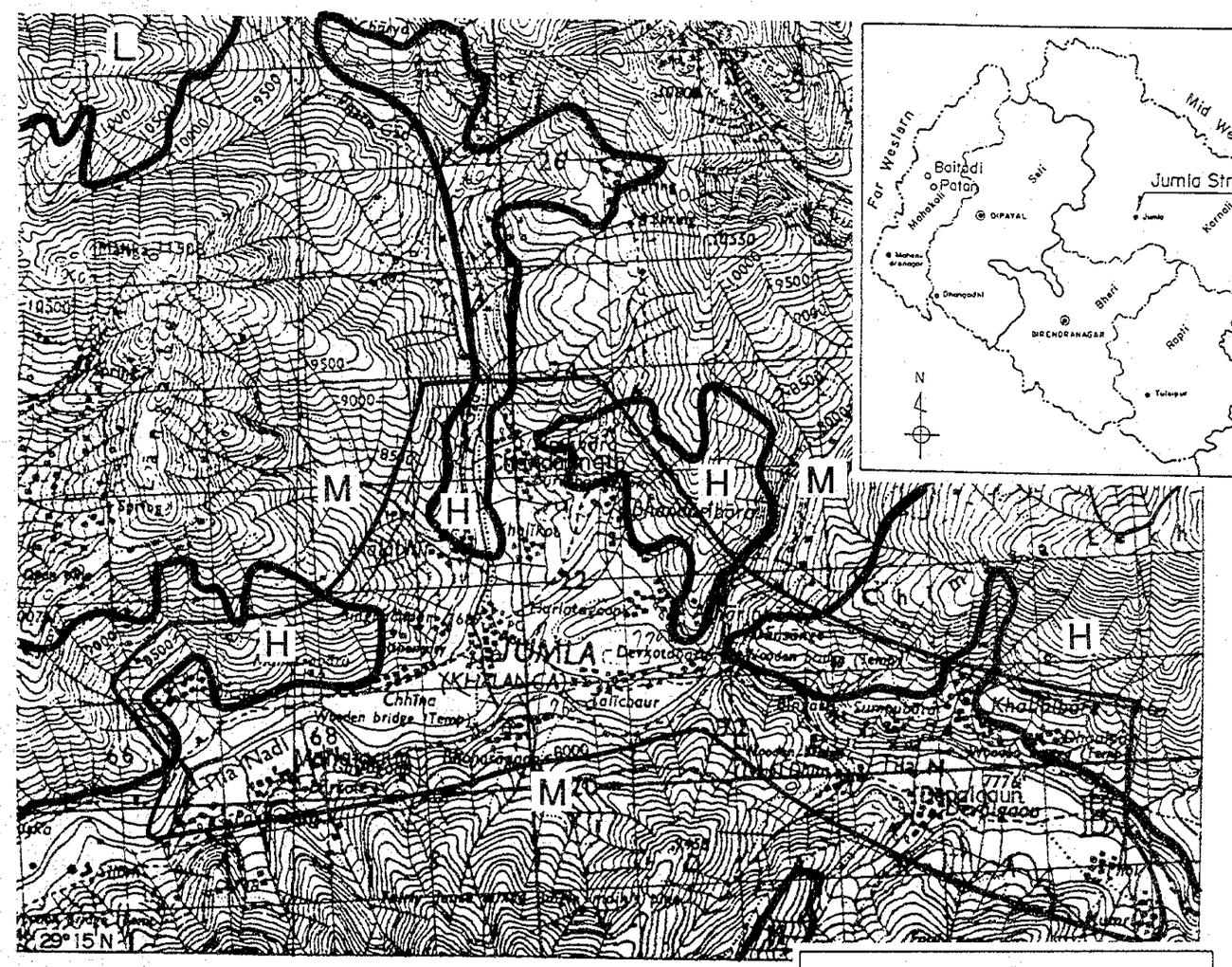


Figure 2.3.1 Subsistence Aguricultural System

HIS MAJESTY'S GOVERNMENT OF NEPAL
WATER RESOURCES DEVELOPMENT OF
THE UPPER KARNALI RIVER AND MAHAKALI RIVER BASINS
JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 3.2.1 Erosion-Prone Area and Land Utilization of the Jumla Strategic Area

Topography and Erosion – Prone Area



L : Low erosion – prone

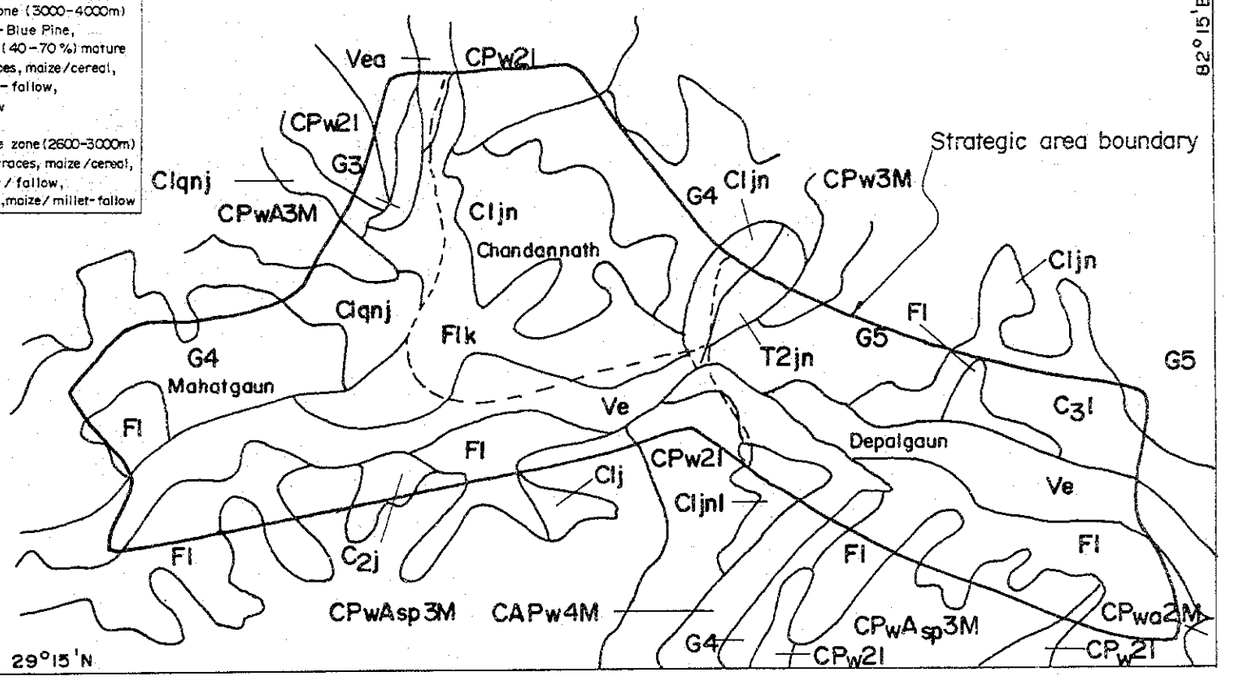
M : Medium erosion – prone

H : Highly erosion – prone

Legend

- Flk : Alluvial fan, maize / cereal maize / mustard
- Fl : Alluvial fan, maize / cereal
- Ve : Valley floor, rice / cereal
- G5 : Grazing land, sub-alpine zone (3000-4000m)
- CPw3M : Coniferous-Blue Pine, crown density (40-70 %) mature
- Cljn : Sloping terraces, maize/cereal, maize / millet-fallow, cereal / fallow
- G4 : Grazing land, cool temperate zone (2600-3000m)
- Clqnj : Sloping terraces, maize/cereal, cereal-fallow / fallow, cereal / fallow, maize / millet-fallow

Land Utilization



Source : Land Resources Mapping Project

0 1 2km.
(SCALE)

HIS MAJESTY'S GOVERNMENT OF NEPAL
WATER RESOURCES DEVELOPMENT OF
THE UPPER KARNALI RIVER AND MAHAKALI RIVER BASINS
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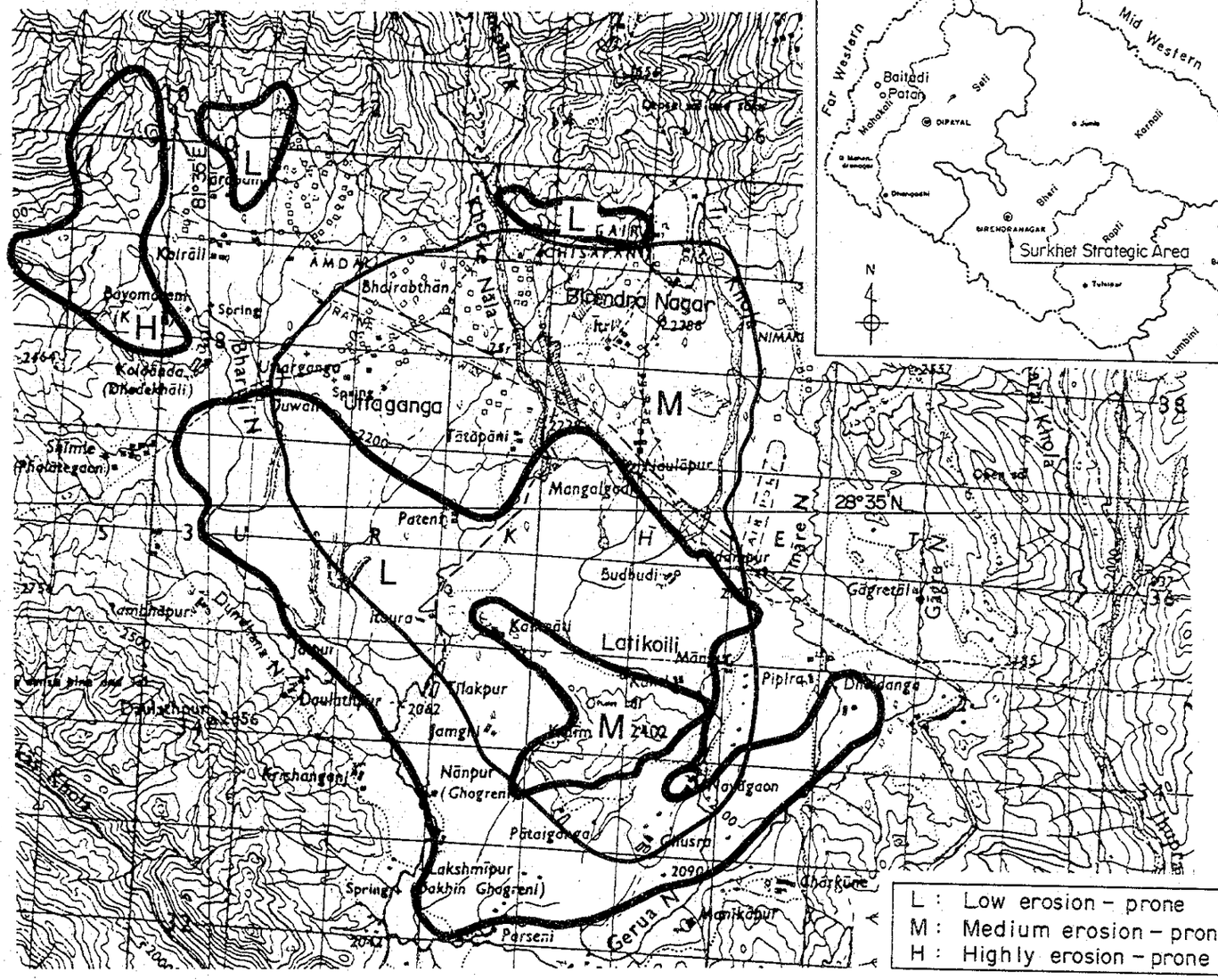
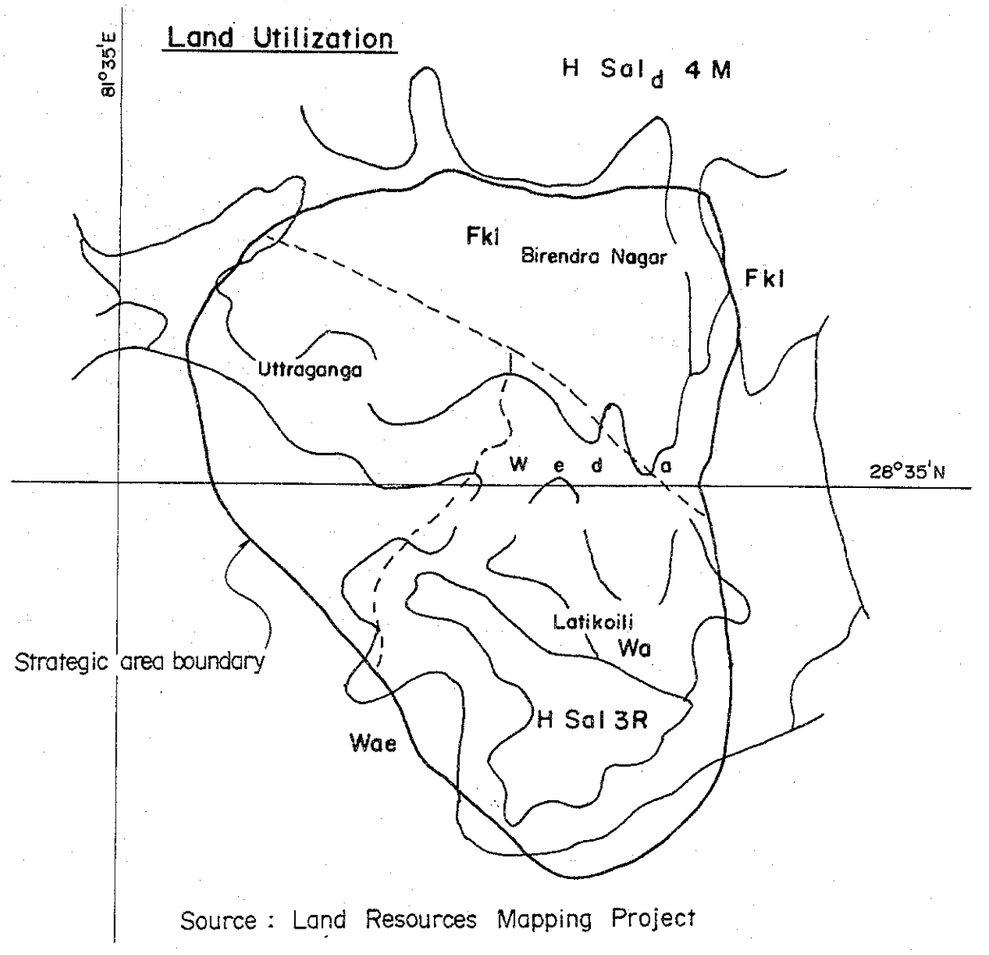
Figure 3.3.1 Erosion-Prone Area and Land Utilization of the Surkhet Strategic Area

Topography and Erosion – Prone Area



Land Utilization



Legend

- Fkl : Alluvial fans, maize/mustard or maiz /cereal
- H Sal d 4M : Hard wood sal forest degraded, crown cover above 70% matured forest
- H Sal 3R : Hard wood sal forest crown cover 40 – 70% matured forest
- W e d a : Wet land
  - rice / cereal
  - rice / pulse
  - rice / fallow

0 1 2km
(SCALE)

Source : Land Resources Mapping Project

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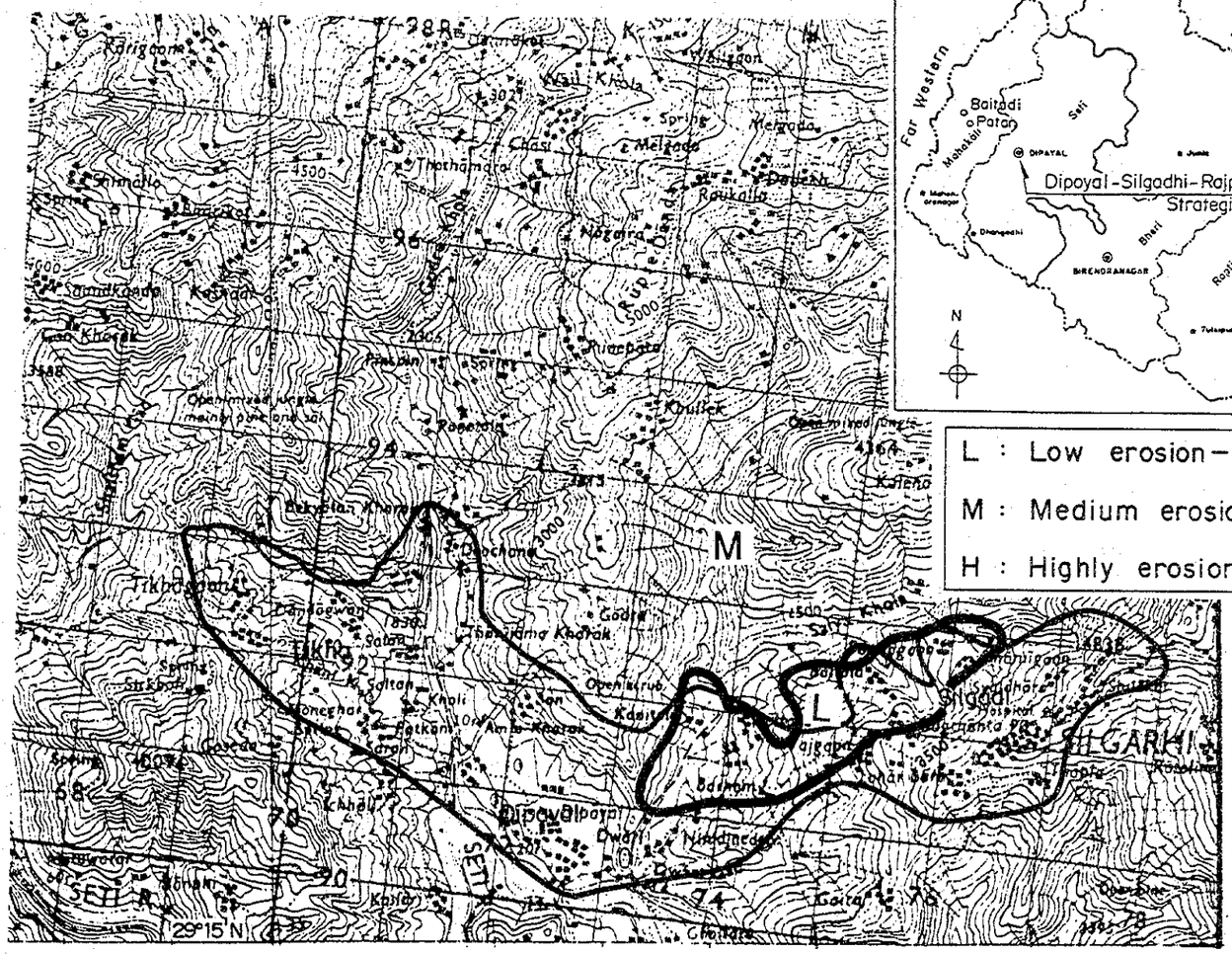
Topography and Erosion – Prone Area

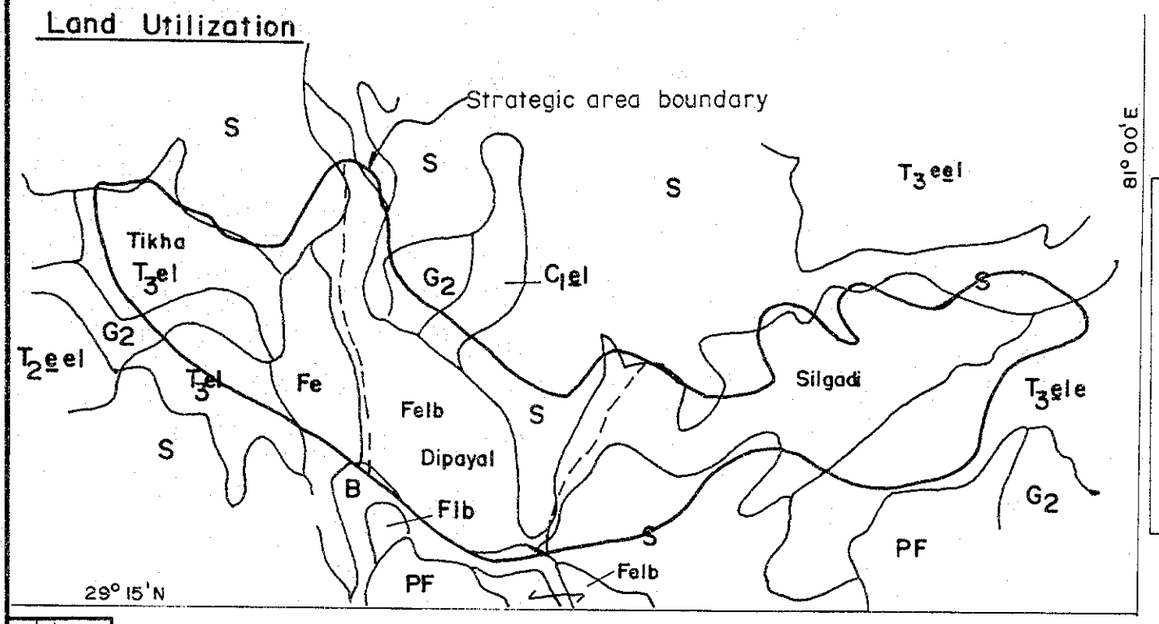


L : Low erosion – prone

M : Medium erosion – prone

H : Highly erosion – prone

Land Utilization



Legend

S	:	Shrub
Fe	:	Alluvial fan, rice/cereal
Felb	:	Alluvial fan, rice/cereal, maize / cereal, rice/cereal – oilseed
G2	:	Grazing land, warm temperate zone (1000–2000m)
T3el	:	Level terrace, temperate zone (2000–2600m), rice/cereal, maize/cereal
PF	:	Protection forest

Source : Land Resources Mapping Project

0 1 2 km.

(SCALE)

Figure 3.4.1 Erosion-Prone Area and Land Utilization of the Dipayal-Silgadhi-Rajpur Strategic Area

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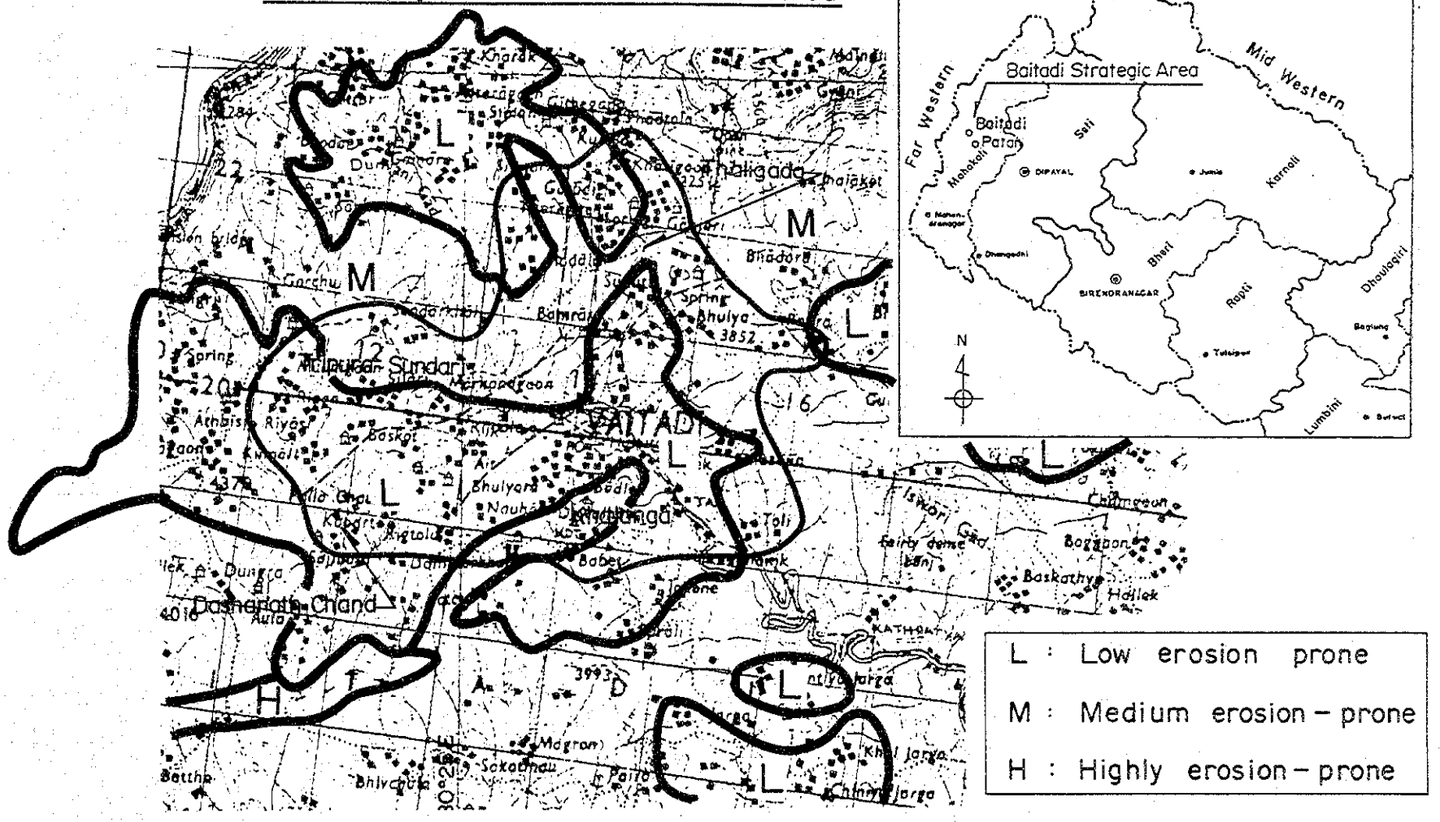
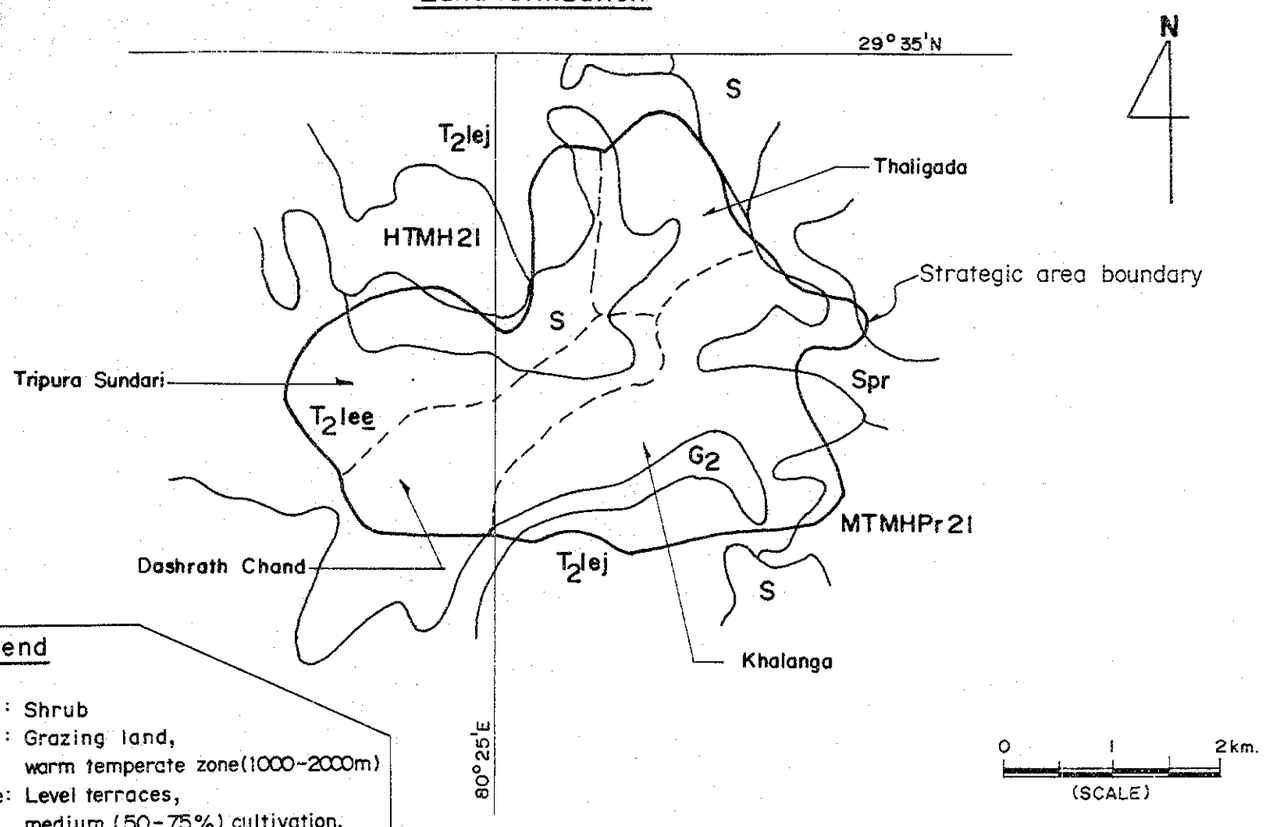
Figure 3.5.1 Erosion-Prone Area and Land Utilization of the Baitadi Strategic Area (1/2)

Topography and Erosion – Prone Area



Land Utilization



Legend

- S : Shrub
- G2 : Grazing land, warm temperate zone(1000–2000m)
- T2lee: Level terraces, medium (50–75%) cultivation, maize /cereal, rice / cereal
- T2lej: Level terraces, medium (50–75%) cultivation, maize /cereal, rice / cereal, maize / millet – fallow
- HTMH21 : Hard wood, tropical hardwoods crown density 10–40%, immature

Source : Land Resources Mapping Project

HIS MAJESTY'S GOVERNMENT OF NEPAL
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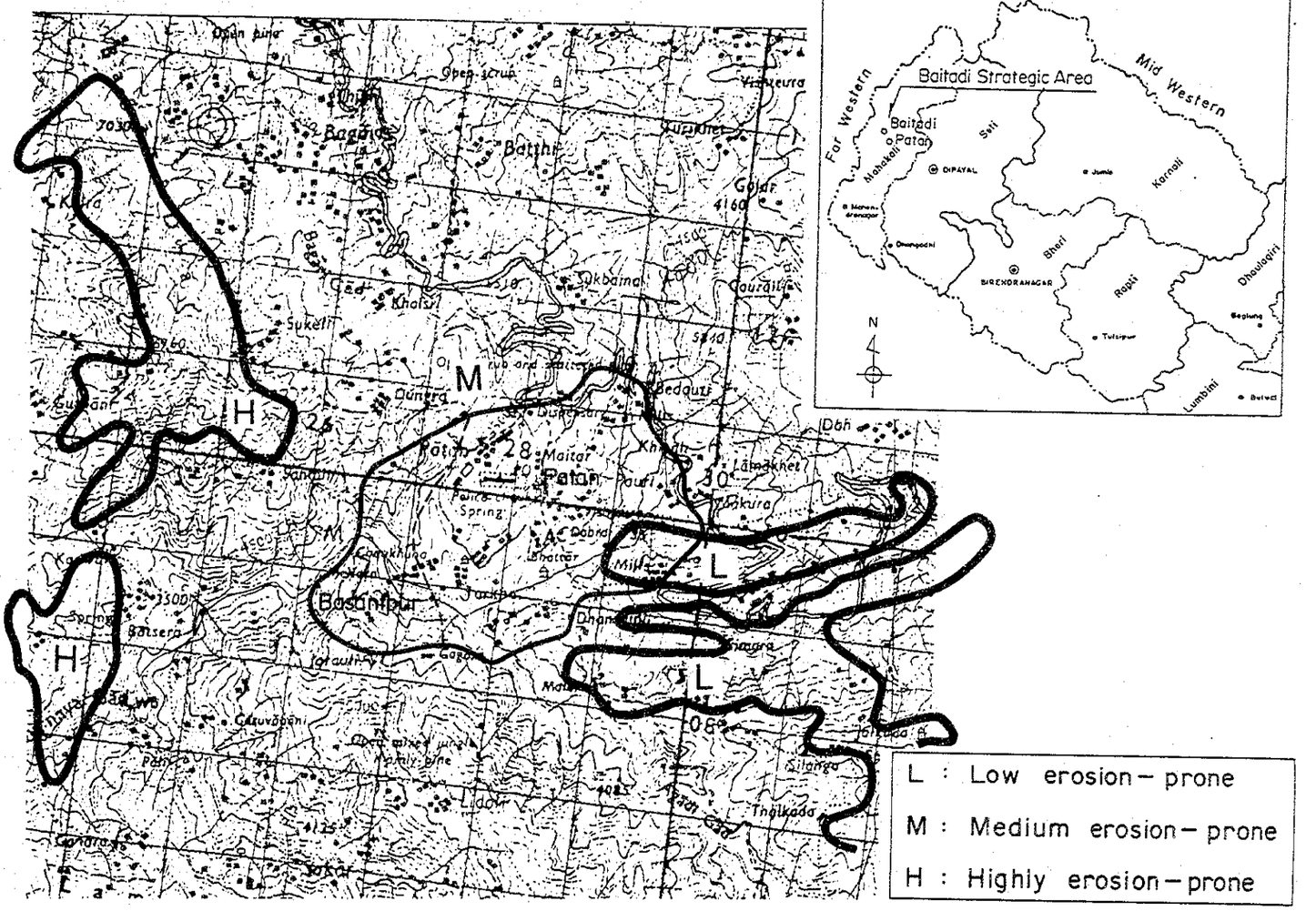
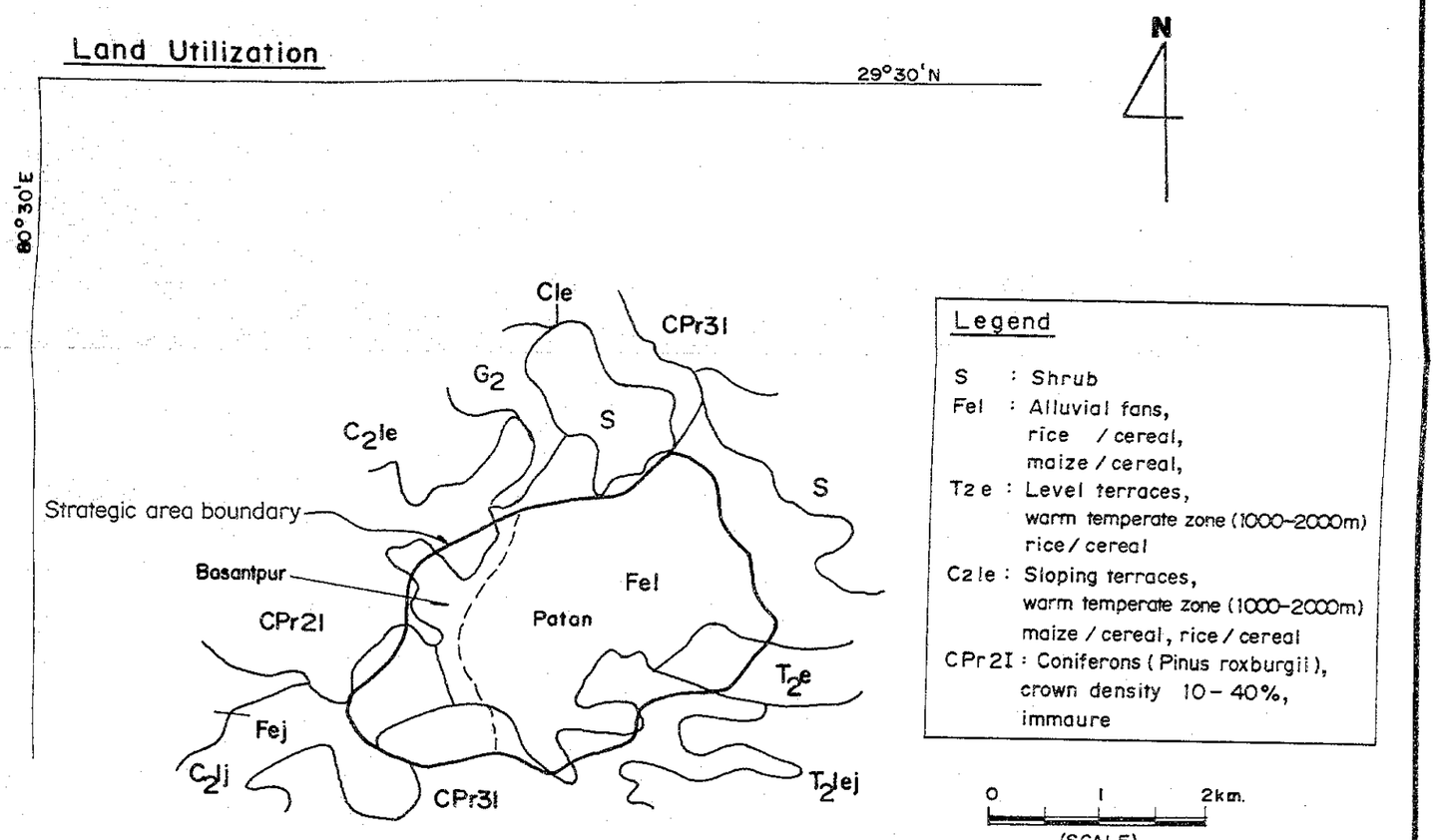
Topography and Erosion – Prone Area



Land Utilization



Source : Land Resources Mapping Project

Figure 3.5.1 Erosion-Prone Area and Land Utilization of the Baitadi Strategic Area (2/2)

HIS MAJESTY'S GOVERNMENT OF NEPAL
WATER RESOURCES DEVELOPMENT OF
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JAPAN INTERNATIONAL COOPERATION AGENCY

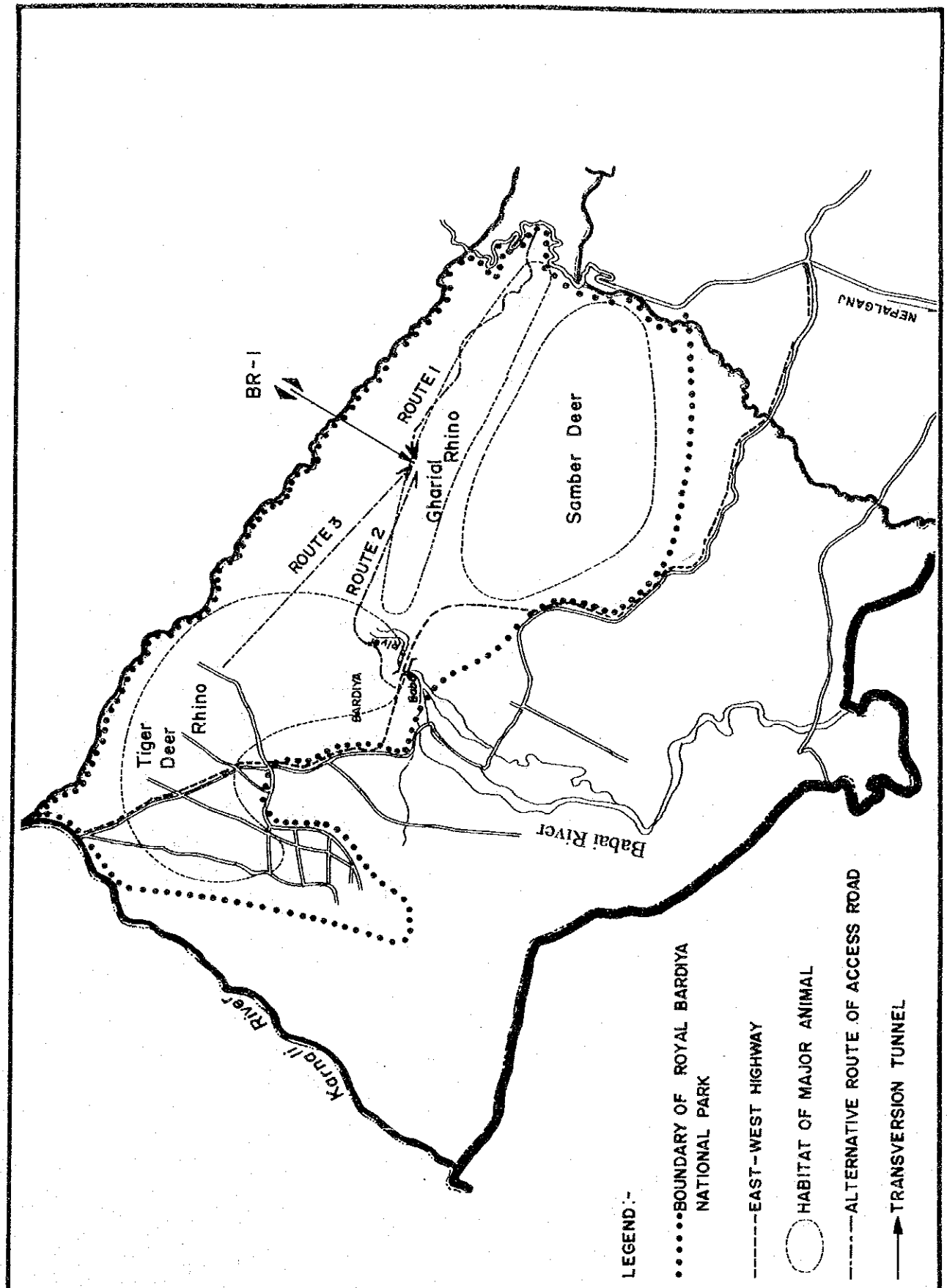

Figure 4.1.1 Alternative Access Routes to the Tailrace Outlet of BR-1

HIS MAJESTY'S GOVERNMENT OF NEPAL
WATER RESOURCES DEVELOPMENT OF
THE UPPER KARNALI RIVER AND MAHAKALI RIVER BASINS
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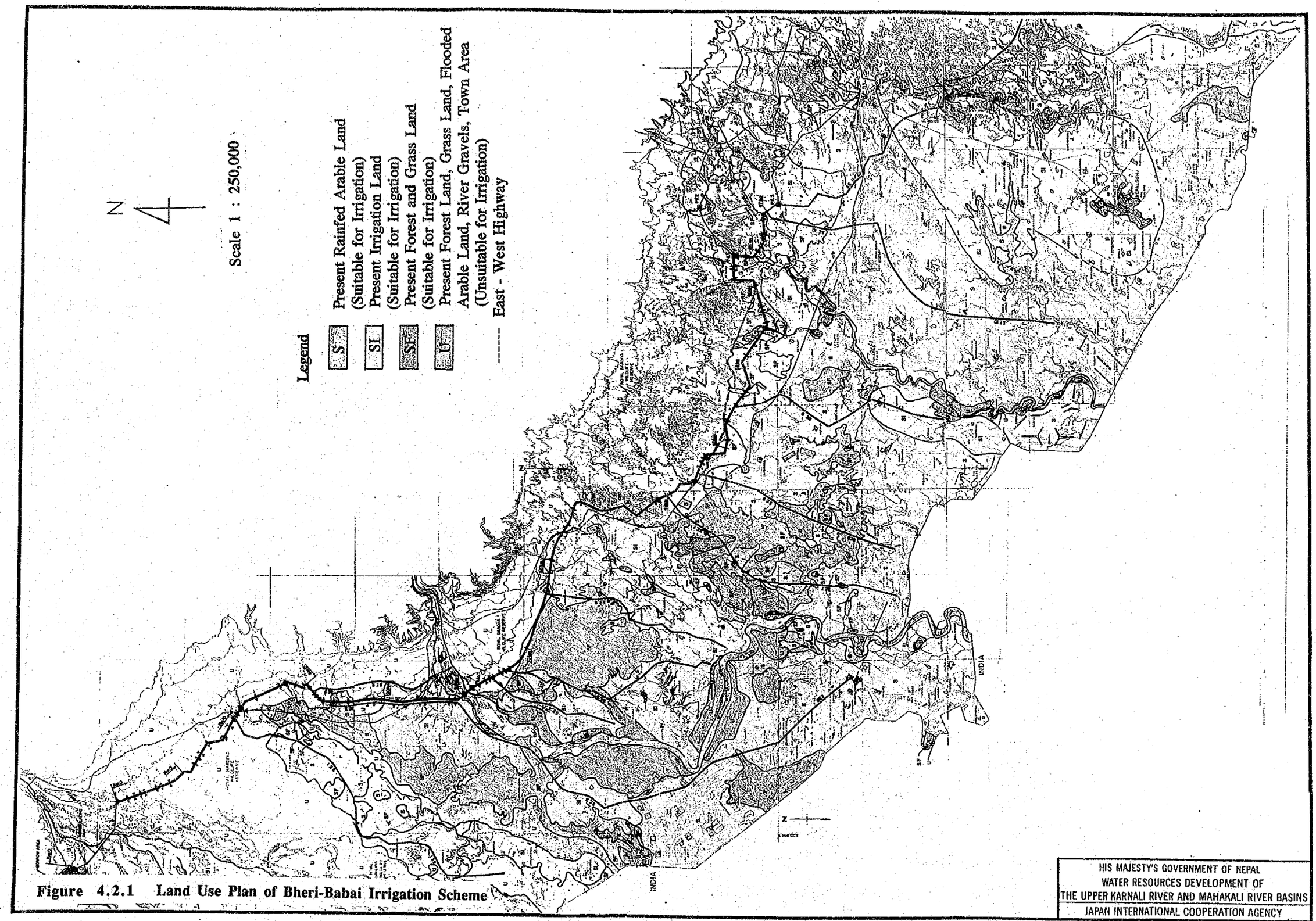
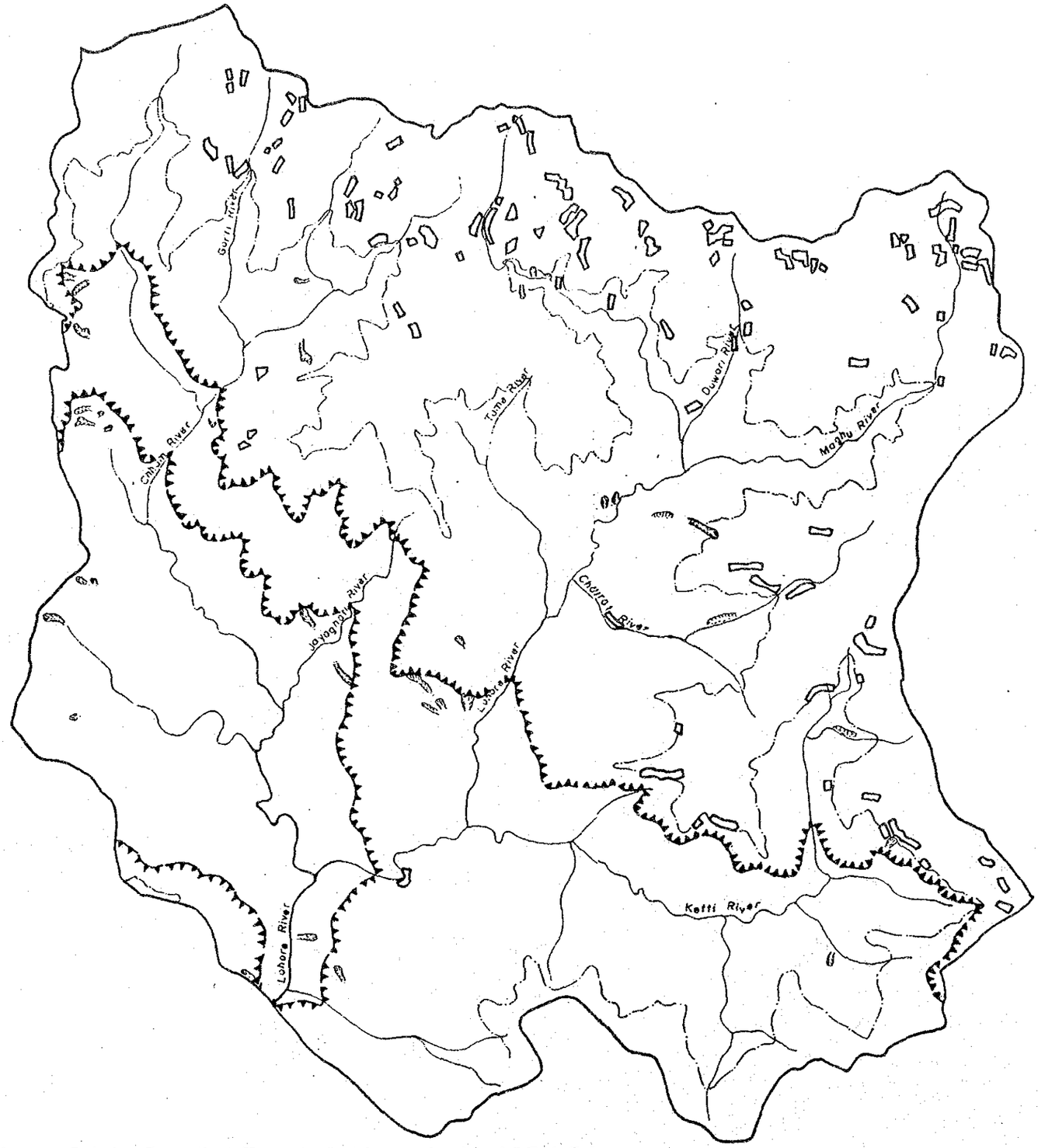


Figure 4.2.1 Land Use Plan of Bheri-Babai Irrigation Scheme



LEGENDS

- CONTOUR LINE OF 6,000 FEET A. S.L.
- MAIN CENTRAL THRUSTS (MCT)
- ROCK EXPOSURE, CLIFF
- SLOPE FAILURE, LAND SLIDE, GULLY INTRUSION

0 1 2 3 4 5 Km.

SCALE

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Figure 5.1.1 Geological Hazard Map in the Basin of LR-1 Scheme

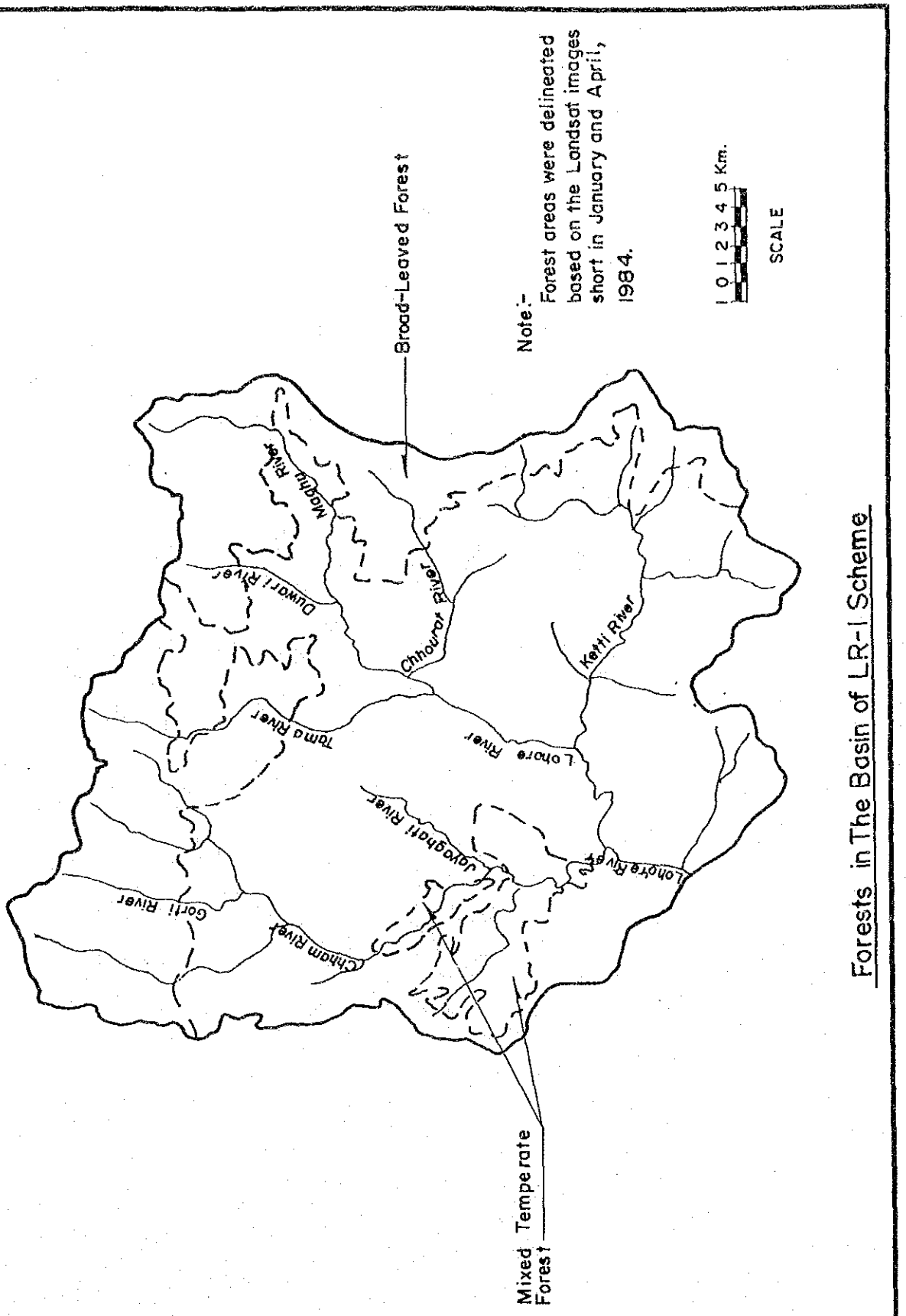

Figure 5.1.2 Forest in the Basin of LR-1 Scheme

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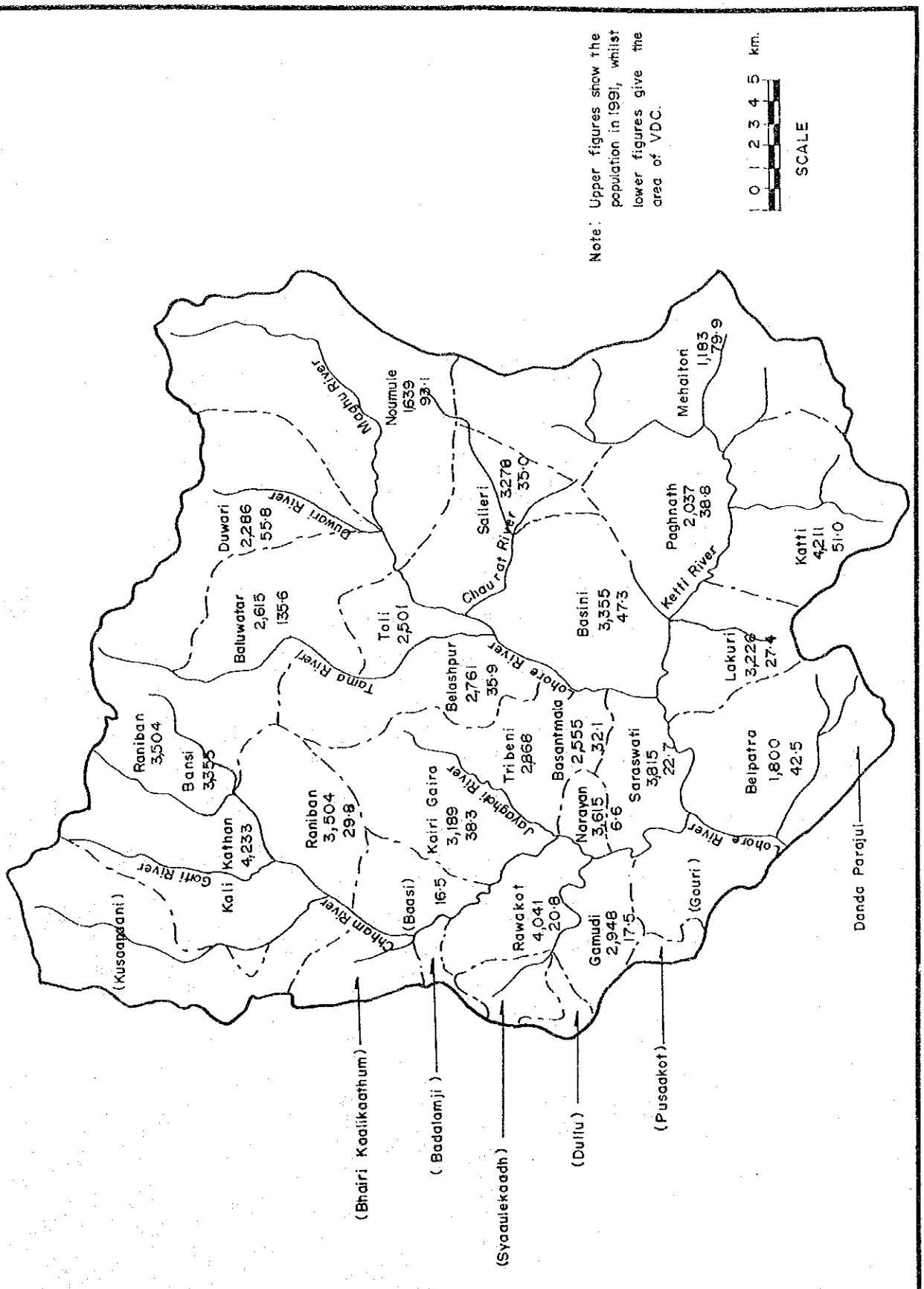

Figure 5.1.3 Population and Its Density of Village Development Committees in the River Basin of LR-1 Scheme

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