Chapter VII: Flood Hazard Assessment

7.1 Introduction

Bank failure, river shifting and river deposition in association with high intensity rainfall induced flash flood in the Himalayan forelands in Jalpaiguri district of North Bengal are primarily nature's way of adjusting fluvial dynamics. Such an adjustment has been deleteriously distributed by the human interferences. The catchments of the rivers like Diana, Khanabati (Rethi-Dimdima), Pagli, Sukriti, Pana, Kaljani, Dima, Jainti, etc. have been seriously disturbed by various kinds of interferences.

As a result, during heavy and concentrated rainfall, catastrophic soil erosion and innumerable landslides are caused transporting huge amount of sediment to the rivers which are incapable of transporting the load efficiently under the existing hydrological conditions, especially along their lower reaches (Froehlich, W. Soja R. & Sarkar S. 2000). The situation has aggravated further due to quarrying activities in some places. Riverbeds are rising at many sections in the plains, resulting in the lessening of cross-sectional areas which being incapable of arresting the unusual monsoon discharge and allow water to spill, causing devastating floods, bank erosion and avulsion (NBFCC, 1965).

Flash flood has not been an uncommon phenomenon in the region. But the frequency and magnitude of such events has increased many fold during the recent past. Such catastrophic events during 1968, 1993, 1998 & 2000 demonstrate the enormity of damage and ever-increasing threat to the society, economy and the environments (Starkel, L & Sarkar, S, 2002; Starkel et. al, 2008).

7.2. Assessment of cost of flood hazard

Cost of flood hazard is a specialized subject involving an assessment of its multi-dimensional effects. Such cost involves from the loss of individual's immovable properties, livestock, crops etc. area measurable unit and also involves agony, sufferings and even human life constitute a part of the cost which is not simply measurable. Destruction of virgin forests due to flood have had an unimaginable environmental cost. In fact, such a loss along

with its priceless biodiversity can never be measured in terms of money. Thousands of years nature's process culminate into a virgin forest and under no circumstances it can be reverted. Flood induced course debris deposition on fertile flood plain often convert the once fertile arable area into barren and wasteland which have had tremendous downstream effect in terms of socio-economic arena of the affected area. Similarly, the accumulation of dolomite in the soil of duars contiguous to Bhutanese territory has already made irreparable damage to the soil with a cascading effect on biodiversity as well as agro-ecosystem of sub-Himalayan Jalpaiguri district. Such an effect is not measurable rather adjustable at the cost of high level technical skill with adopting capability of the stakeholders.

An attempt has been made in this chapter to assess the cost/impact of flood hazards in sub-Himalayan Jalpaiguri district. Data for such an assessment has mostly been accessed from secondary sources (Sarkar, 2007; 2008 & WAPCOS, 2003).

7.2.1. Assessment of environmental cost

During monsoon, high intensity rainfall induces innumerable landslides and mass movements, which transport huge amount of loads from the upper catchment to the rivers, which are incapable of transporting the load efficiently under the existing hydrological conditions. Thus, the river beds are rising at many places, resulting in the lessening of cross sectional areas, which being incapable of arresting the unusual monsoonal discharge can cause devastating floods, endangering the vital lines of communications, human habitation, firm lands, forest stands and wild life. The following are the specific impacts:

7.2.1.1 Rising of river bed

A detail account on the rising of river bed during the period between 1984 to 2006, due to flood induced aggradations has been made in chapter VI and shown in table 6.1. It is observed that most of the rivers of sub-Himalayan Jalpaiguri district exhibit an abnormal rise in their respective bed. The large transient rivers like Tista, Torsa, Sankosh show a rise between 0.8 to 1.0 meter. While, the river originating from lower Darjeeling and Bhutan hills exhibited much higher rate of rise. The river Jainti, Pagli, Lish, Rethi, and Bala recorded a rise of 3.05, 2.54, 2.49, 2.145 and 2.012 meter respectively. In fact the watershed of these rivers are situated along the southern slope of rising Himalayan frontier and acts like a barrier

to the rain bearing south west monsoon and yielded heaviest rainfall of the region. As a result, innumerable landslides are caused to transport to huge materials during high intensity rainstorm induced flood (Sarkar, 2007, 2008).

The mining activities in Bhutan also produce huge quantity of loose materials on the slope. During monsoon, high intensity rainfall induces innumerable landslides and mass movements, which transport huge amount of loads from the upper catchment to the rivers, which are incapable of transporting the load efficiently under the existing hydrological conditions. Thus, the river beds are rising at many places, resulting in the lessening of cross sectional areas, which being incapable of arresting the unusual monsoon discharge can cause devastating floods, endangering the vital lines of communications, human habitation, firm lands, forest stands and wild life (Sarkar, 2004).

7.2.1.2 Bank failure and avulsion

Rising of riverbeds often invites devastating bank failure. Field study reveals that massive bed material deposits on the Lish, Jainti, Pagle, Bala, Rethi, Diana and Dima during the flood of 1993 and 2003 caused massive bank failure in these rivers at a distance of about 1 to 10 km from the Himalayan margin. Such bank failure often cause addition burden of silt load to the river. The study of the 1993 flood caused deposits over 150,000 cubic meters of materials into the river bed (Sarkar, 2004). The study on the river Pagli, near Lankapara shows that over 75 million cubic meter debris was deposited along a stretch of 6.5 kilometer in between the year 1993 and 2000 (WAPSOS, 2003).

Rising of riverbeds and bank failures often culminates into the shifting of river course. Many rivers of this region demonstrate such shifting of which the Jainti, Chel, Dima, Bala, Daikhowa, Jhumur etc. are noteworthy. There exist innumerable evidences of avulsion and river metamorphosis in old maps and records.

The first recorded disastrous flood of this region occurred in 1787. It caused dramatic changes to the river Tista, which used to flow into the Ganga, deserted its channel and emptied itself into the Brahmaputra through an ancient spill channel (Dhar O.N., Nandargi S., 2000). Numerous deserted riverbeds of the Tista, Torsa, Sankosh, Raidak and Jaldhaka bear

the testimony to the fact that the river changed its course at ease often in consequence of heavy rains in the following years.

Historical documents on the floods and flood-induced avulsion of the sub-Himalayan rivers viz., Allen B.C. et. al, 1906; Dash, A.J., 1947; Gruning, J.F, 1911; Imperial Gazetteer,1909; Rennel,1779; Mitra,1964; Sanyal,1969 etc. are numerous and fascinating. Record reveals that up to 1787, the river Tista and Karotoya were the same river that flowed through the Atrai-Punarbhaba into the Ganga. Neotectonic activity coupled with high intensity rainfall induced flash-flood caused massive shifting of the river. The so-called whale backed subsurface ridge of the Baikanthapur-Fulbari became active and the Tista migrated eastwards bifurcating the river Karotoya.

7.2.1.3 Enlargement of river valley

River valley widening is another significant detrimental effect of degradation in the upper catchment especially in the Bhutan Himalaya. Comparative analysis of old Topographical maps and recent Satellite imageries show that most of the small and medium rivers in this area expanded as much as three times in their valley width during the last 100 years. Field measurement by the NBFCC also reveals that the valley width of the sub-Himalayan small and medium rivers i.e., Jainti, Dima, Bala, Pana, Basra, Turturi and Buxa Jhora increase by 250% during the period of 1992-2010. There is every possibility to form a number of coalesceing mega-valley in near future i.e., (i) Lish-Gish-Chel mega-valley; (ii) Jaldhaka-Diana-Kuji Daina-Gatia mega-valley; (iii) Pagli-Titi-Sukriti mega-valley; (iv) Dima-Bala mega-valley; (v) Pana-Basra mega-valley etc.

7.2.1.4 Forest and biodiversity

One of the most important direct environmental cost caused by the heedless degradation in the upper catchment in the sub-Himalayan Jalpaiguri and adjacent Bhutan is the destruction of rich natural forest - the biodiversity hotspot at Global scale. Between 1993 to1999, 850 hectares of good forestland was destroyed either by bank failure or by shifting river courses. Over 2 million trees were destroyed – only the market price of lost timber was approximately 15,000 million rupees.

Dolomite dust transported by overland flow and river accumulates on the forest floor, are found to be responsible for the destruction of undergrowth vis-a-vis biodiversity and health hazard to the wild life. Alkalinity of soil hinders the availability of phosphate to the plants ultimately leads to death of over 5000 Sal trees at Jainti & Santrabari during 1998-2000 (Sarkar, S, 2008).

7.2.2 Assessment of economic cost

It is rather difficult if not impossible to assess the economic cost of flood hazards. This is especially true in case of Jalpaiguri district where frequent flood of different dimensions affect a wide range of economic activities. An attempt has been made in the following sections to assess the economic cost of some of the recently occurred flood hazard in Jalpaiguri district.

7.2.2.1 Loss of tea gardens

In between 1993 to 1999, 75 hectares of tea garden land was lost forever due to bank failure and floods. In monitory terms this amounts to 1,500 million Rupees. And between 2000 to 2010 another 54 hectares of tea garden land was lost forever due to bank failure and flood induced accumulation. Makrapara tea garden situated in Bhutan border has been assessed as the worst affected. Over 65% of its total area is affected and production also reduced by 60% in 1980s.

Accumulation of calcium on the tea garden soil has detrimental effect both in term of productivity and quality. Productivity is decreasing in many tea gardens and the quality is also deteriorating.

7.2.2.2 Deterioration of water & soil quality

Dolomite and calcium rich river water is destroying the aquatic diversity and also deteriorating water quality. Dissolved calcium also moves into the subsurface through the soil pores and thereby deteriorates the quality of sub-surface water.

Unregulated release of dolomite causes accumulation of calcium in the soil. This increases the pH value that has detrimental effects to many traditional crops including tea. In some extreme cases calcium crust may also develop and thereby, once fertile soil may turn sterile.

7.2.2.3 Health hazard

Dolomite contamination in the Sub-Himalayan West Bengal and Bhutan cause serious health hazard to the local people. Study reveals that the incidence of kidney stone is two times more among the people residing in Jainti-Rajabhatkhawa-Chamurchi-Birkand-Makrapara-lankapura area.

7.3 Identification of vulnerable areas

For addressing the issue of flood management and anti-erosion programme one of the most important and immediate task is to identify the reaches which have already been attacked by the river during floods or are prone to get adversely affected in future. Implementation of any flood control measure would entail identification of such locations, possible causes of failure and a set of viable solutions.

7.3.1 Identification of vulnerable river bank

Identification of vulnerable river bank involves the study of fluvial dynamics of the concern river section, past occurrences of failure along with the level of human interferences in the studied sections. WAPCOS in 2003 made a detail field survey and identify susceptible and/or vulnerable river banks of the river Tista in Jalpaiguri district (table 7.1).

The vulnerable sites have also been plotted in map (figure 7.1). It is observed that the tributary streams of the Tista system at the debauching point have a tendency of eroding its bank and also under the continuous filling up of channel beds as a result flooding becomes an annual feature. However, along the extreme south of the district near its confluences vast sheet of water engulfed vast tracts under prolonged inundation. Nine vulnerable sites have

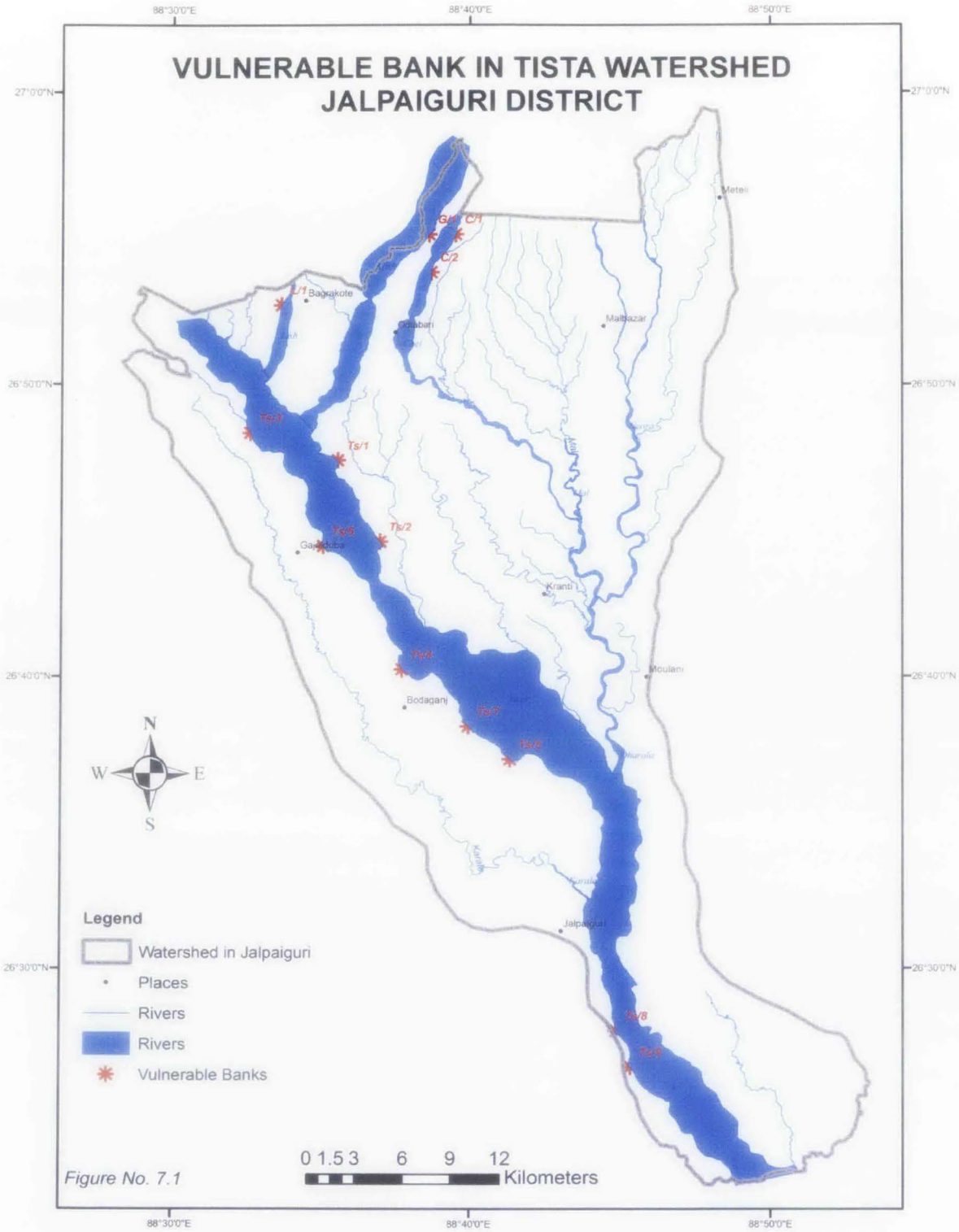

VULNERABLE BANK IN TISTA WATERSHED
JALPAIGURI DISTRICT
88°30'0"E
88°40'0"E
88°50'0"E
27°0'0"N
26°50'0"N
26°40'0"N
26°30'0"N
Metali
Malbazar
Baganakote
Kranti
Moulani
Bodaganj
Jalpaiguri
G/1
C/1
C/2
L/1
Ts/1
Ts/2
Ts/4
Ts/5
Ts/7
Ts/8
Ts/9
N
S
E
W
Legend
Watershed in Jalpaiguri
Places
Rivers
Rivers
Vulnerable Banks
0 1.5 3 6 9 12
Kilometers

Figure No. 7.1

been identified along the both banks of the river Tista. A number of vulnerable sites have also been identified along the river bank of Lish, Gish and Chel.

Table – 7.1
Vulnerable zones in Jalpaiguri district along the Tista valley

SOI Ref.	*No.*	*River / Stream*	*Location*	*Remarks*
78 B/9	L/1	Lish	Bridge 1 km south of Weshabari	Regular maintenance of the guard wall required.
	G/1	Gish	Bridge 1 km east of Mynabari	Regular maintenance of the guard wall required.
	C/1	Chel	Bridge 2 km south east of Mynabari	Regular maintenance of the guard wall required.
	C/2	Chel	3 km southeast of Mynabari	Older channel may rejuvenate at any time.
78 B/10	Ts/1	Left bank of Tista	Adjacent to Apalchand Forest	Main flow towards the left bank canal of Tista Barrage
	Ts/2	Left bank of Tista	Adjacent to Changmari Reserve Forest	Course/flow may be straightened.
	Ts/3	Left bank of Tista	2 km north east of Baikunthapur	Presently river flowing along the embankment which may be affected during high discharge.
	Ts/4	Right bank of Tista River	Adjacent to Raipur Tea Garden	Embankment may affected
	Ts/5	Right bank of Tista	½ km north of Paharpur	Embankment may affected
	Ts/6	Right bank of Tista	1 km east of Bodaganj	Embankment may affected
	Ts/7	Confluence of Chuchuka and Tista	Adjacent to eastern Jalpaiguri Town	Embankment may affected
78 B/11	Ts/8	Tista	In and around Mandalghat	River Tista may breach embankment during high discharge.
78 B/15	Ts/9	Tista	In and around Mandalghat	River Tista flows along the embankment may be affected during high discharge.

The vulnerable sites along the river Jaldhaka has been tabulated in table 7.2 and diagrammatically represented in figure 7.2. It is observed that the tributary streams of the Jaldhaka system at the debauching point have a tendency of eroding its bank and also under the continuous filling up of channel beds as a result flooding becomes an annual feature.

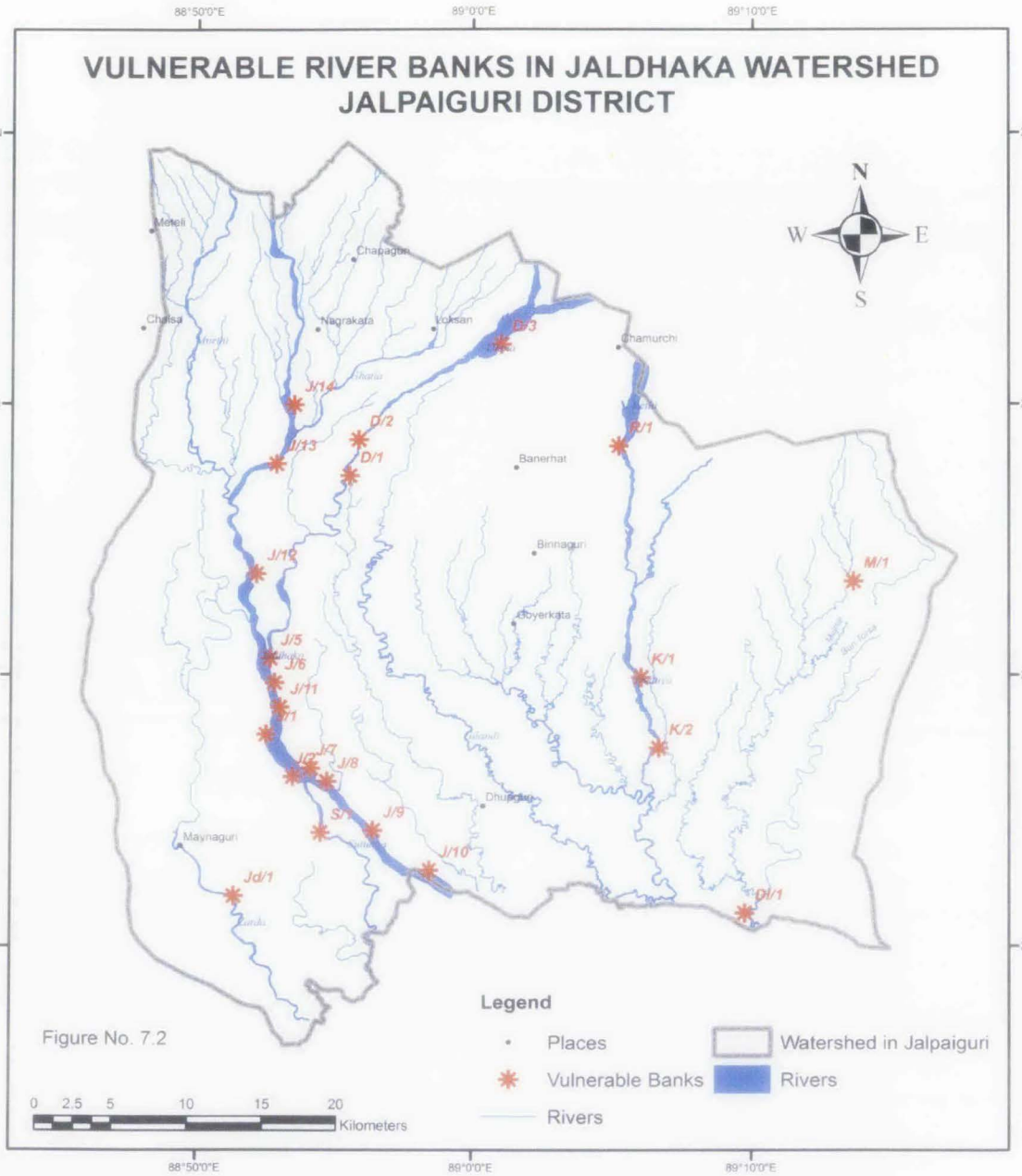

VULNERABLE RIVER BANKS IN JALDHAKA WATERSHED
JALPAIGURI DISTRICT
88°50'0"E
89°0'0"E
89°10'0"E
27°0'0"N
26°50'0"N
26°40'0"N
26°30'0"N
N
S
W
E
Meteli
Chapagari
Chulsa
Nagrakata
Koksan
Chamurchi
Banerhat
Binnaguri
Goyerkata
Dhupguri
Maynaguri
D/3
J/14
D/2
J/13
D/1
R/1
J/12
M/1
J/5
J/6
J/11
K/1
K/2
J/7
J/8
S/1
J/9
J/10
Jd/1
Dl/1
Legend
Places
Vulnerable Banks
Rivers
Watershed in Jalpaiguri
Rivers
0 2.5 5 10 15 20
Kilometers

Figure No. 7.2

However, along the extreme south of the district near its confluences vast sheet of water engulfed vast tracts under prolonged inundation. Over 13 vulnerable sites have been identified along the both banks of the river Jaldhaka. A number of vulnerable sites have also been identified along the river bank of Diana, Rethi, Khanabati, Mujnai, Jarda and the spill channel Satanga.

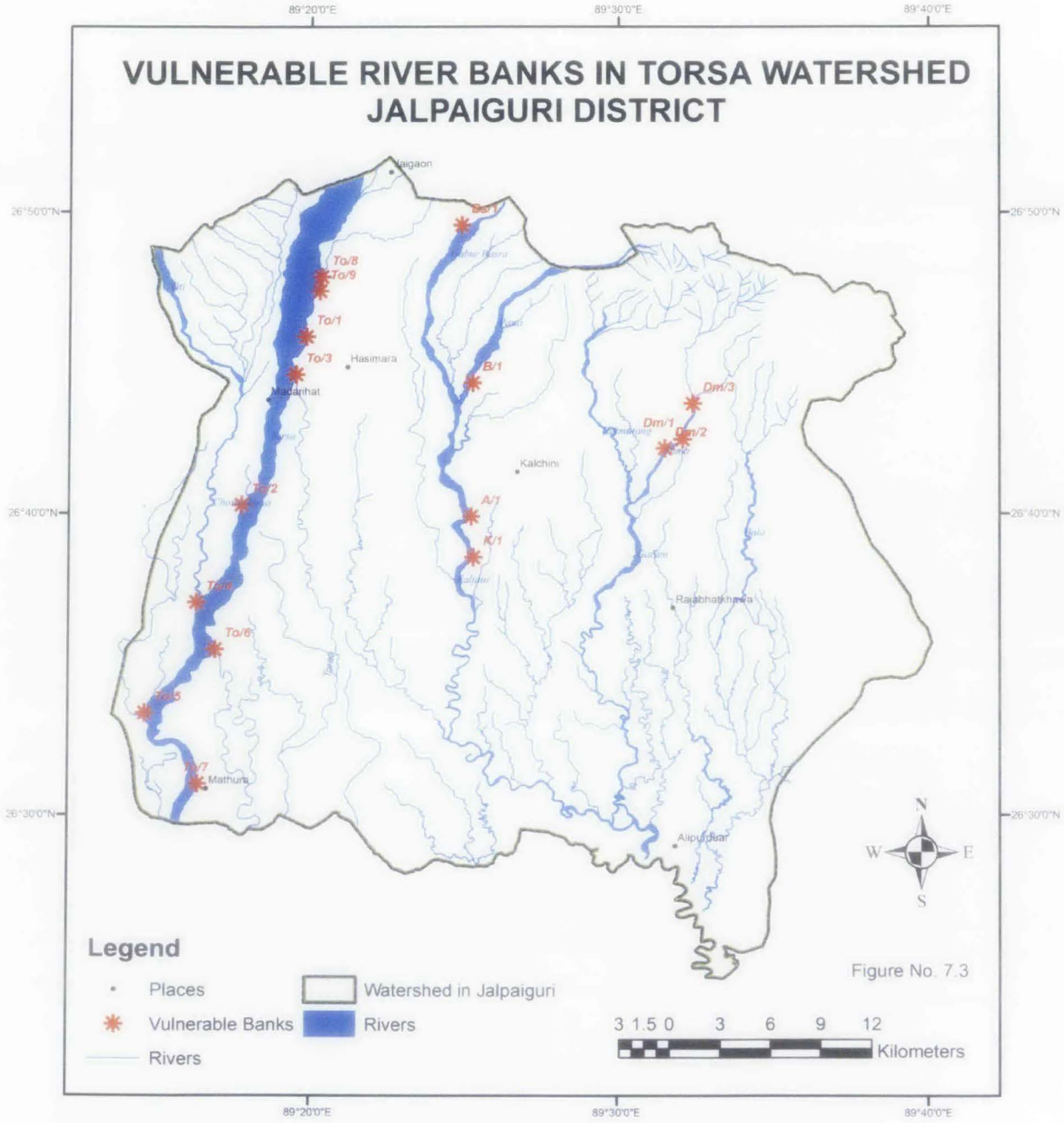
Table – 7.2

Vulnerable zones in Jalpaiguri district along the Jaldhaka valley

SOI Ref	*No*	*Rivers*	*Location*	*Remarks*
78 B/14	J/1	Jaldhaka	Right bank of river Jaldhaka and west of Purba Baragila	The river bank line is very near to embankment.
	J/2	Jaldhaka	Right bank of river Jaldhaka 1 km south of Betagara	Susceptible zone for bank failure, high discharge may affect the embankment.
	J/3	Jaldhaka	0.5km south of Dhawlaguri	The river bank line is very near to embankment.
	J/4	Jaldhaka	Right bank of river from south of NH-31 up to Kadamtali	Susceptible zone for bank failure, high discharge may affect the embankment.
	J/5	Jaldhaka	Left bank of river Diana adjacent to Jaldhaka Tea Garden upto Phataktari	Zone of bank failure, older channels may be activated during high discharge, embankment may totally be destroyed.
	J/6	Jaldhaka	Adjacent to Diana Reserve Forest, a linear zone along the left bank of Diana Nadi starting from Garialtari to Gadhayar Kuthi.	The abandoned spill channel may reactivate some water may pass out through Jhumar Nadi in December 1998 situation prevails.
78 F/3	J/7	Jaldhaka	South of Maguramari village and east of Jore Simuli	River flows along the embankment, may be affected during high discharge.
	J/8	Jaldhaka	Left bank of Jaldhaka	Abandoned spill channels may be reactivated during peak monsoon, also the embankment may be affected during high discharge
	J/9	Jaldhaka	Left bank of Jaldhaka River	River presently flows along embankment.
	J/10	Jaldhaka	Left bank of Jaldhaka near north west of Angarkataparoduti.	It may be reactivated and may affect the embankment during high discharge.
	J/11	Jaldhaka	South of Bhandani and the junction of Daukhawa Nadi	Older channel may be rejuvenated.

78 B/13	D/1	Diana	Left bank near about 1.5km north east of Ridaypur village	Rangati nala now being an active spill channel may inundate a large area during high discharge.
	D/2	Diana	Right bank of Diana, adjacent to Diana Reserve Forest.	Presently river flowing along the embankment which may be affected during high discharge.
	J/12	Jaldhaka	Left bank of river Jaldhaka south of Bamandanga.	Embankment may be affected during high discharge.
78 F/8	J/13	Jaldhaka	Near Takimari	Spill channel of Jaldhaka river, which is almost abandoned now, may be reactivated causing serious damage of the embankment.
78 F/2	J/14	Jaldhaka	North of Rangapani Balasi along the left bank of the Jaldhaka river.	Present course of river Jaldhaka flows along the embankment, which may be affected during high discharge
	K/1	Khanabati	East of Lakshipur	Due to shifting of river, some portion of adjacent road has been damaged.
	K/2	Khanabati	0.5km south of Kazipara	Road adjacent to the river may get affected during high flood situation.
	M/1	Mujnai	0.5km south of Rangali bazna	Road adjacent to the river may get affected during high flood situation.
78 B/15	Jd/1	Jarda	2 km south east of Panisala village	Jarda Nadi flows besides the road thus threatening it.
	S/1	Satanga	Adjacent to Baraghara village	A seasonally active spill channel joins with Satanga just at the point of intersection with the road.
78 F/1	Dl/1	Dharala	Left bank adjacent to Khengti village	Older channel may rejuvenate at any time.
	D/3	Diana	Left bank 2 km east of Red bank tea garden.	Bank failure zone along Diana river.
	Rt/1	Rethi	Elongated zone from Chamurchi to Riabari tea garden	Rehti khola flows along the embankment.

The vulnerable sites along the river Torsa has been tabulated in table 7.3 and diagrammatically represented in figure 7.3. It is observed that the tributary streams of the Torsa system at the debauching point have a tendency of eroding its bank and also under the continuous filling up of channel beds as a result flooding becomes an annual feature.


VULNERABLE RIVER BANKS IN TORSA WATERSHED
JALPAIGURI DISTRICT
89°20'0"E
89°30'0"E
89°40'0"E
26°50'0"N
26°40'0"N
26°30'0"N
Jaigaon
Hasimara
Madarihat
Kalchini
Rajabhatkhawa
Alipurduar
Mathura
Be/1
To/8
To/9
To/1
To/3
B/1
Dm/3
Dm/1
Dm/2
To/2
A/1
K/1
To/6
To/7
N
W
E
S
Legend
Places
Vulnerable Banks
Rivers
Watershed in Jalpaiguri
Rivers
3 1.5 0 3 6 9 12
Kilometers
Figure No. 7.3

However, along the extreme south of the district near its confluences vast sheet of water engulfed vast tracts under prolonged inundation. Nine vulnerable sites have been identified along the both banks of the river Torsa. A number of vulnerable sites have also been identified along the river bank of Dima, Gabur Basra, Alikuri, Kaljani and Basra.

Table – 7.3

Vulnerable zones in Jalpaiguri district along the Torsa valley

SOI Ref	*No*	*River / Stream*	*Location*	*Remarks*
78 F/6	To/1	Torsa	Adjacent to Nilpara Reserve Forest	Though these points the Torsa may get rejuvenated but it may affect the Jaldapara sanctuary.
	To/2	Torsa	Adjacent to Jalapara Reserve Forest	
	To/3	Torsa	Left bank of Sil Torsa	Presently river flowing very close to the embankment which may be affected during high discharge.
	A/1	Alaikuri	Adjacent to Kalchini tea Garden, left bank of Alaikuri River	River Alaikuri is presently flowing along the embankment, which may get affected during high discharge.
	B/1	Buri Basra and River Kaljani Junction	Near Dakshin Mendabari	Buri Basra Badi may in future get connected/joined in Kaljani River at this point.
	Dm/1	Dima	Right bank of Dima adjacent to the Buxa Reserved Forest.	The shifting of the river course Dima towards west gradually eroding the Tea Garden.
	Dm/2	Dima	Right bank of Dima adjacent to the Buxa Reserved Forest	The shifting of the river course Dima towards west gradually eroding the Tea Garden.
78 F/7	To/4	Torsa	Right bank of Torsa, area between Chapaguri and Kalpani	It is a prominent bank failure zone, very close to the adjacent road, may cause a serious damage during high flood.

	To/5	Torsa	Right bank of Torsa, near Bheledanga and Ghugumari	Torsa presently flows along the adjacent roadway, which may cause damage during high flood situation.
	To/6	Torsa	Area of railway and roadway bridge on Torsa near Ghugumari.	This zone is a vulnerable zone due to abnormal trend of the curvature of Torsa, which may cause damage to the adjacent roadway and railway.
78 F/11	To/7	Torsa	Left bank of torsa near south of Taliguri and east of Ghargharian	Presently river flows along the embankment. Further eastward shifting of Torsa may affect the embankment Torsa may engulf the Ghargharia Nadi.
	Kj/1	Kaljani	Right bank of Kaljani near Maruganjhat	Further shifting of river banks may affect the adjacent road.
78 F/5	To/8	Torsa	East of Jaigoan Tea Garden	The rivers are affecting the adjacent Tea Garden and orchards.
	To/9	Torsa	Left bank of river Torsa and west of Dalsingpara Tea Garden.	Due to bank failure Dalsingpara Tea Garden may be affected in future as the river flows along the embankment.
	Bs/1	Barsa	Right bank of Basra Nadi adjacent to Gabur Basra Reserve Forest	The river flows presently along the embankment and already destroyed flow portion of the embankment.
78 F/9	Dm/3	Dima	Buxa will Reserve Forest.	Areas of active landslide

The vulnerable sites along the river Raidak has been tabulated in table 7.4 and diagrammatically represented in figure 7.4. It is observed that the tributary streams of the Raidak system at the debauching point have a tendency of eroding its bank and also under the continuous filling up of channel beds as a result flooding becomes an annual feature. However, along the extreme south of the district near its confluences vast sheet of water engulfed vast tracts under prolonged inundation.

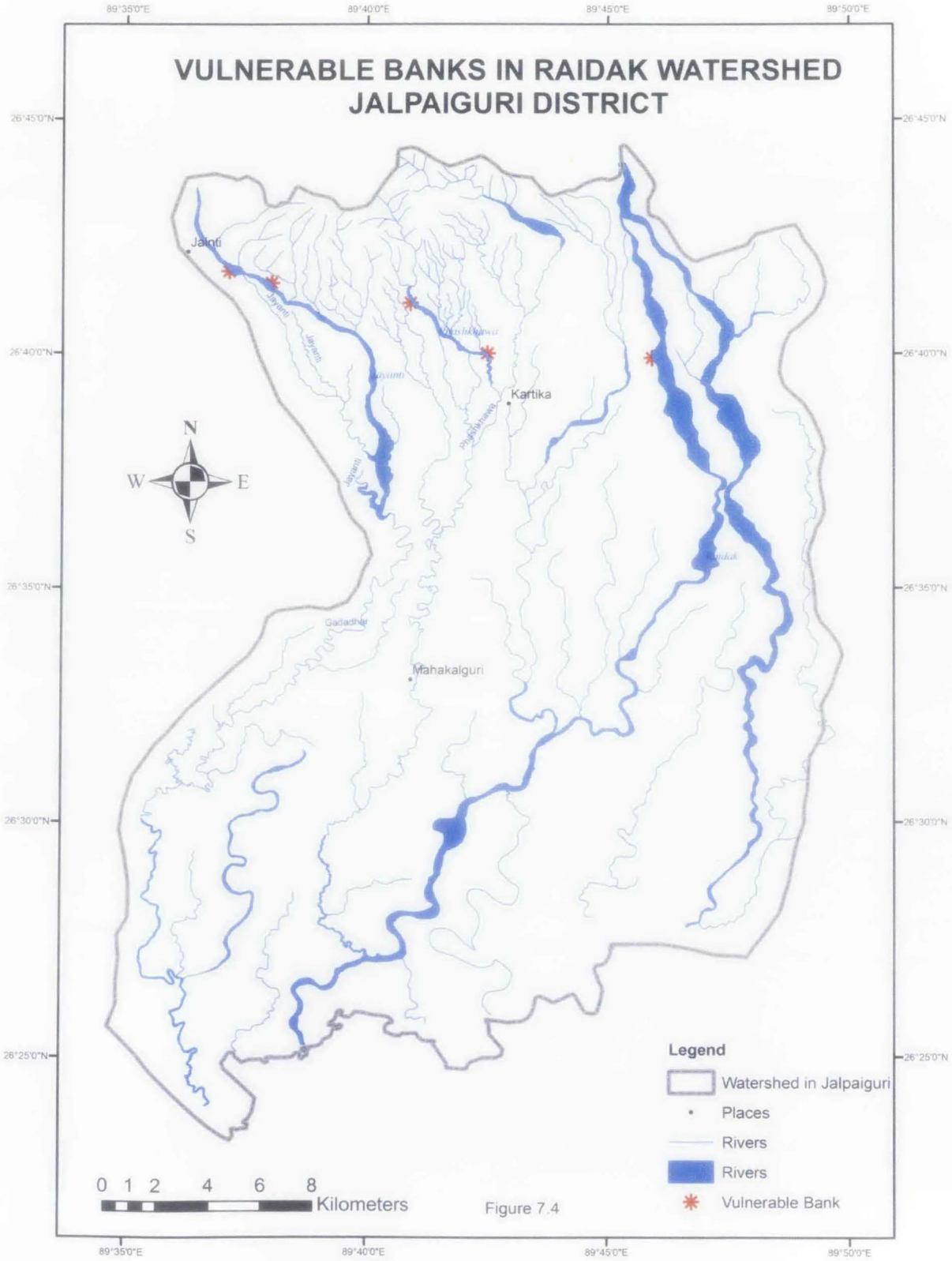

VULNERABLE BANKS IN RAIDAK WATERSHED
JALPAIGURI DISTRICT
89°35'0"E
89°40'0"E
89°45'0"E
89°50'0"E
26°45'0"N
26°40'0"N
26°35'0"N
26°30'0"N
26°25'0"N
Jalpaiguri
Kartika
Mahakalguri
Gadadhar
N
S
W
E
Legend
Watershed in Jalpaiguri
Places
Rivers
Rivers
Vulnerable Bank
0 1 2 4 6 8
Kilometers

Figure 7.4

Table – 7.4
Vulnerable zones in Jalpaiguri district along the Raidak valley

SOI Ref	*No*	*River / Stream*	*Location*	*Remarks*
78 F/14	R/1	Kulkuli Nala and Raidak river	1.5 km west of Chengmari	Older embankment has been eroded; road is presently being affected by Raidak -I. Kulkali Nadi is acting as a spill channel of Raidak river.
78 F/10	Jn/1	Jainti	North of Tapgaon Forest	River Jainti flows along the embankment presently, which may be affected during high discharge.
	P/1	Phaskhoa	Left bank of Jainti near Garokhutta	River almost engulfing the road.
	P/2	Phaskhoa	Adjacent to Kohinoor Tea Garden	River almost engulfing the road.
78 F/9	Jn/2	Jainti	North of Buxa Duar	River Jainti has eaten up considerable area of her high bank.

7.3.2 Identification of vulnerable area

In the previous section the vulnerable river banks have identified, assessed and maped for further analysis. An attempt has been made in this section to identify spatially flood hazard prone or vulnerable area in Jalpaiguri district. Such identification, characterization and mapping is of pre-requisite for any flood management plan. In fact, degree of management need depends on the degree of vulnerability including intensity, frequency and magnitude of probable flood disaster with defined return period. Vulnerability assessment of flood hazard in sub-Himalayan North Bengal has been carried out based on:

1. Magnitude and frequency of past flood occurrences
2. Nature of drainage conditions and
3. Terrain characteristics.

Survey of India topographical maps, satellite image and other secondary sources has been applied to assess the above mention vulnerability assessment parameters. The flood hazard vulnerability vis-à-vis flood prone map thus prepared is shown in figure 7.5. It is interesting to note that 35.91% of the total geographical area of Jalpaiguri district is flood prone. The flood prone area in Jalpaiguri district has been categorized into the following 3 broad categories:

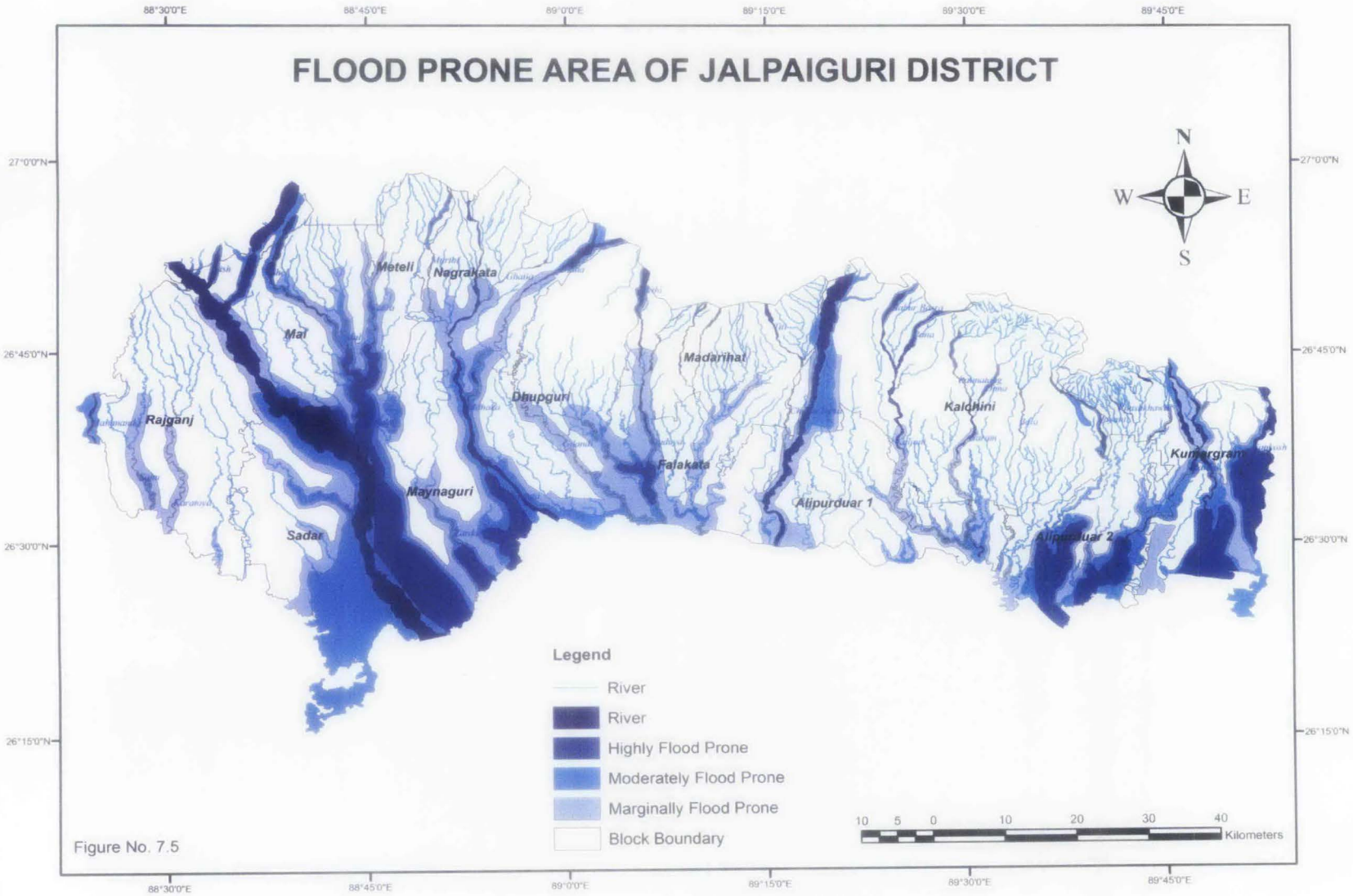

FLOOD PRONE AREA OF JALPAIGURI DISTRICT
N
W
E
S
Meteli
Nagrakata
Mal
Madarihat
Dhupguri
Rajganj
Kalchini
Falakata
Maynaguri
Alipurduar 1
Sadar
Alipurduar 2
Legend
River
River
Highly Flood Prone
Moderately Flood Prone
Marginally Flood Prone
Block Boundary
10 5 0 10 20 30 40
Kilometers
88°30'0"E
88°45'0"E
89°0'0"E
89°15'0"E
89°30'0"E
89°45'0"E
27°0'0"N
26°45'0"N
26°30'0"N
26°15'0"N

Figure No. 7.5

7.3.2.1 Highly flood prone area

These are the areas which are highly susceptible to disastrous flash floods and prolonged inundation causing massive devastation to the land and properties. A total area of 382.96 sq. km (6.15% of the total geographical area of the district) has been identified as highly flood prone (figure 7.5). Kumargram block was worst affected followed by Alipurduar 2, Maynaguri, Mal and Falakata. Among the rivers Sankosh, Raidak, Jaldhaka and the left bank of the river Tista inundate large tracts of country side almost every year during high intensity and prolonged rainfall in the catchments. Following areas have been identified under this category:

a) Raidak - Gadadhar interfluve
b) Torsa - Kaljani interfluve
c) Mansai - Torsa interfluve
d) Dhaula - Raidak interfluve
e) Jaldakha - Gilandi area
f) Changmari - Mekhliganj area
g) Jaldakha - Gilandi confluence area

7.3.2.2 Moderately flood prone area

These are the areas which are moderately susceptible to disastrous flash floods and prolonged inundation causing considerable loss of the land and properties. A total area of 888.61 sq. km (14.27% of the total geographical area of the district) has been identified as moderately flood prone (figure 7.5). Among the blocks Kumargram, Alipurduar 2, Sadar, Maynaguri, Mal, Falakata, Kalchini, Alipurduar 1, Rajganj, Sadar and Madarihat has been found affected. The following areas have been identified under the category of moderately flood prone:

a) Dhaula - Raidak interfluve
b) Reti-Pagli-Sukriti area
c) Duduya - Jaldhaka interfluve
d) Torsa - Kaljani interfluve
e) Barobhisa – Kumargram

f) Dima - Pana - Kaljani area

g) Dima - Jainti - Dharasi interfluves

h) Totopara area

i) Bagrakot - Odlabari area

j) Rangdhamali - Jalpaiguri - Haldibari area

k) Jaigaon - Hasimara area

7.3.2.3 Low to marginally flood prone area

These are the areas which are marginally susceptible to disastrous flash floods and prolonged inundation causing some degree of loss of the land and properties. A total area of 964.73 sq. km (15.49% of the total geographical area of the district) has been identified as moderately flood prone (figure 7.5). Almost every blocks of Jalpaiguri district fall under this category. However, the blocks Kumargram, Alipurduar 2, Alipurduar 1, Falakata, Dhupguri, Maynaguri, Sadar, Mal and Nagrakata blocks have been identified as more susceptible to flood hazard of different degrees. It is also interesting to note that almost every rivers flowing through Jalpaiguri district are found to be prone to cause flood. The following areas have been identified under the category of marginally flood prone area:

a) Neora - Chel interfluve

b) Duduya - Jaldhaka interfluve

c) Mara Torsa area

d) Dhaula - Raidak interfluve

e) Dima - Jainti - Dharasi interfluves

f) Mansai - Torsa interfluve

g) Raidak - Gadadhar interfluve

h) Kaljani - Dima area

i) Dhupguri - Falakata area

j) Birpara - Lankapara - Chamurchi - Makrapara area

7.3.2.4 Flood free zone

It is interesting to note that 64.09% of the total geographical area of Jalpaiguri district i.e., 3990.7 sq. km has been considered as normally flood free. However, in case of extreme

event of massive, prolonged and widespread rainstorm as it was happened in 1968 many area hitherto identified as safe zone may also be affected by flood or similar kind of disaster. Out of the identified safe zone, 1.83% area has been identified as hilly area where topography itself is limiting factor for the probability of causing flood. The piedmonts (foot hills) zone covered another 7.5% of the identified safe zone within Jalpaiguri district. These are also topographically protective zone however it is observed that some isolated sections within this area have been suffered from bank failure induced flood hazard. The remaining 50% of the identified safe zone has been identified in alluvial fan and terraces. These are the area situated 5 to 10 meter higher than the active flood plain and are occupied by either natural forest or tea garden.

7.4. Conclusion

Bank failure, river shifting and river deposition in association with high intensity rainfall induced flash flood in sub-Himalayan Jalpaiguri district are primarily nature's way of adjusting fluvial dynamics in the sub-Himalayan North Bengal. Such an adjustment has been deleteriously distributed by the human interferences. The catchment area of these rivers has mostly been deforested and the clearings of the steep slopes have been used for the extension of settlement, agriculture, plantation and communication, disrupting the overall hill slope hydrological balance. As a result, during heavy and concentrated rainfall, catastrophic soil erosion and innumerable landslides are caused transporting huge amount of sediment to the rivers which are incapable of transporting the load efficiently under the existing hydrological conditions, especially along their lower reaches. As a result, the riverbeds are rising at some sections in the plains, resulting in the lessening of cross-sectional areas which being incapable of arresting the unusual monsoon discharge and allow water to spill, causing floods.

Moreover, the narrow road and railway bridges across the rivers as well as the supporting pillars are always considered to be the barriers, interrupting natural load movement behavior of the rivers. This often cause accelerated deposition at the bottom of the bridge and thereby, narrowing the outlets of the rivers gradually. Such constrictions, sometimes due more to the entanglement of uprooted trees to the voluminous flows of the flood, often multiply its effects many times damaging the bridges, human habitations and firm lands.

Flash flood has not been an uncommon phenomenon in the North Bengal plains. But the frequency and magnitude of such events has increased many fold during the recent past. Such catastrophic events during 1968, 1993 &1998 demonstrate the enormity of damage and ever-increasing threat to the society, economy and the environments of North Bengal.

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