Preparing Multi-hazard District Disaster Management Plan

(Supaul, Madhepura, Saharsa, Bhojpur)

Review and Consultation Workshop,

6- 7th January , 2016 September
Hotel Mourya, Patna

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Bihar State Disaster Management Authority

Govt. of Bihar

Gorakhpur Environmental Action Group

District wise Progress so far....

Activities	Supaul	Madhepura	Saharsa	Bhojpur
Literature Review	√	√	√	√
Secondary Data collection	√	√	√	√
1st round shared learning dialougue)	√	√	√	√
Deliverable 1 (Inception report)	√	√	√	√
District Level inception meeting	√	√	√	√
Field visit	√	√	√	√
HRVCA	√			√
HRVCA data analysis	√			

District's Expectation from DDMP

Plan should be :

- Multi hazard Focus (Natural and Man-made)
- Based on comprehensive understanding of HRVCA@
  - System level (Infrastructure , Assets)
  - People (Grass root level)
  - Institution (Policy and Rules)
- Integration of scientific knowledge and local wisdom
- Integration of Development plan, policy and programme
- Integration of CCA and DRR
- Easy- to- use in any scenario

Population Distribution and Social Composition of Survey Districts, 2011

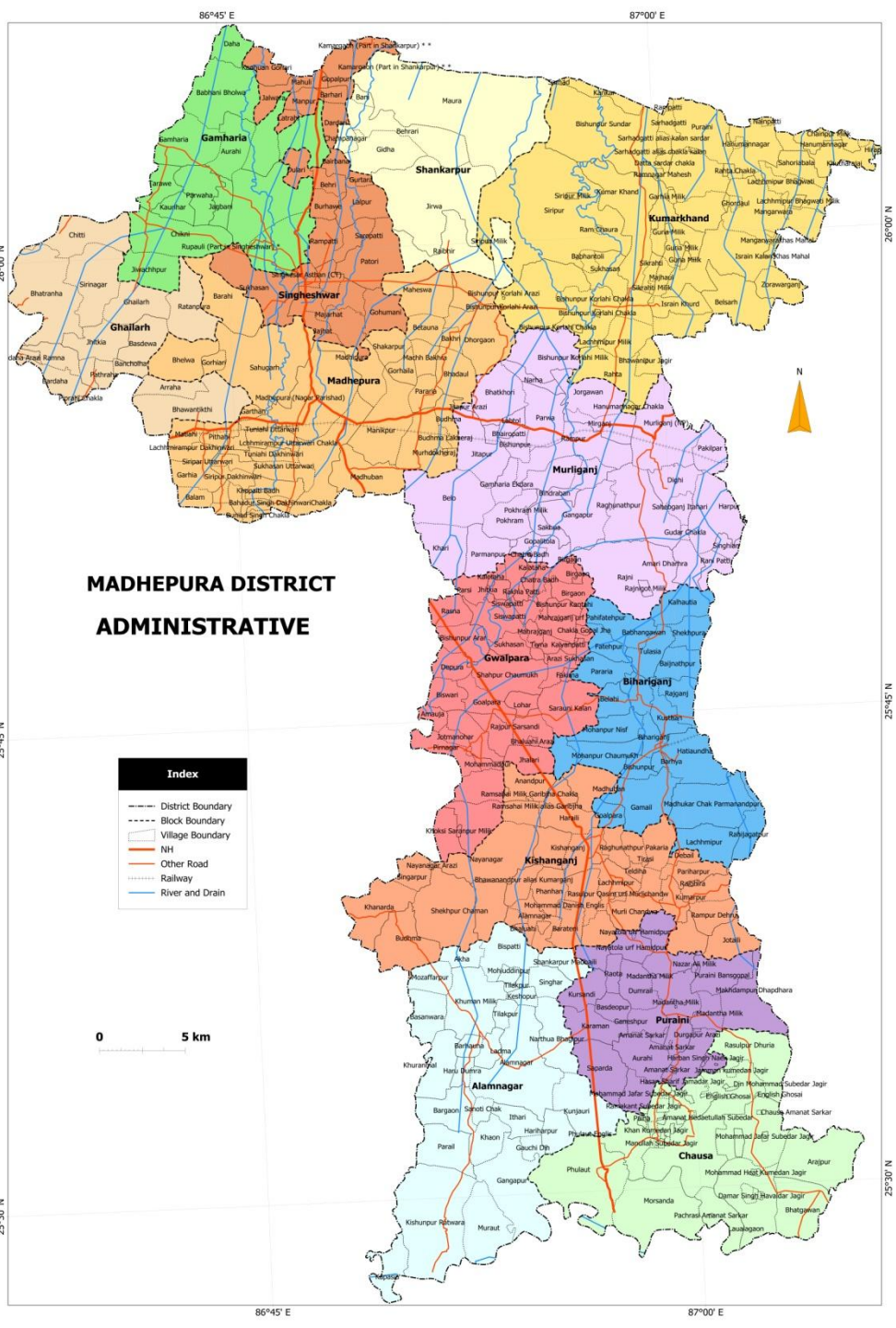
Districts	Population in lakh	Rural population %	Sc %	ST %	Density	Growth 2001-11
Supaul	22.29	95.26	15.89	0.46	919	28.62
Madhepura	20.01	95.58	17.30	0.63	1116	30.65
Saharsa	19.00	91.70	16.69	0.32	1127	25.79
Bhojpur	27.28	85.71	14.78	0.49	2474	21.63

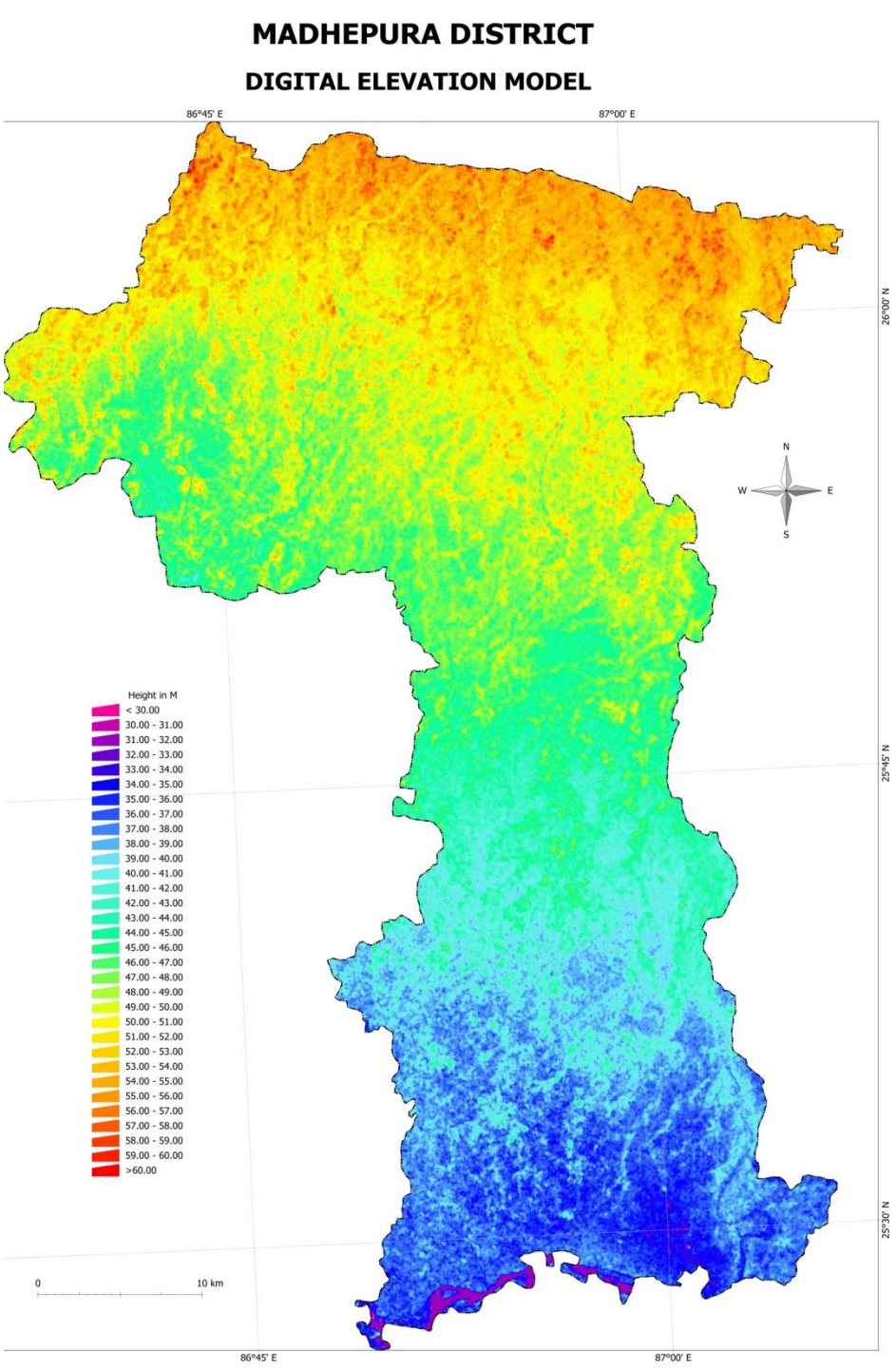
Demographic characteristic and level of literacy in surveyed district, 2011

District	Average HH size	Sex ratio	Literacy %	Per capita income	
Supaul	4.5	929	69.62	3518	
Madhepura	5.0	911	61.77	3346	
Saharsa	5.2	906	63.56	3160	
Bhojpur	4.9	907	70.47	3728	

Occupational profile of workers in surveyed district, 2011

District	% of Total workers	Agricultural labour	Cultivators	HH	Other
Supaul	39.37	52.34	30.17	2.15	15.34
Madhepura	38.84	53.86	30.60	1.85	13.69
Saharsa	34.10	42.87	32.70	2.30	22.13
Bhojpur	30.12	35.99	28.83	4.82	30.36


MADHEPURA DISTRICT
ADMINISTRATIVE
Index
District Boundary
Block Boundary
Village Boundary
NH
Other Road
Railway
River and Drain
0
5 km
N
Gamharia
Shankarpur
Singheshwar
Ghailarh
Madhepura
Murliganj
Kumarkhand
Gwalpara
Bihariganj
Kishanganj
Puraini
Alamnagar
Chausa
86°45' E
87°00' E
26°00' N
25°45' N
25°30' N


MADHEPURA DISTRICT
DIGITAL ELEVATION MODEL
Height in M
< 30.00
30.00 - 31.00
31.00 - 32.00
32.00 - 33.00
33.00 - 34.00
34.00 - 35.00
35.00 - 36.00
36.00 - 37.00
37.00 - 38.00
38.00 - 39.00
39.00 - 40.00
40.00 - 41.00
41.00 - 42.00
42.00 - 43.00
43.00 - 44.00
44.00 - 45.00
45.00 - 46.00
46.00 - 47.00
47.00 - 48.00
48.00 - 49.00
49.00 - 50.00
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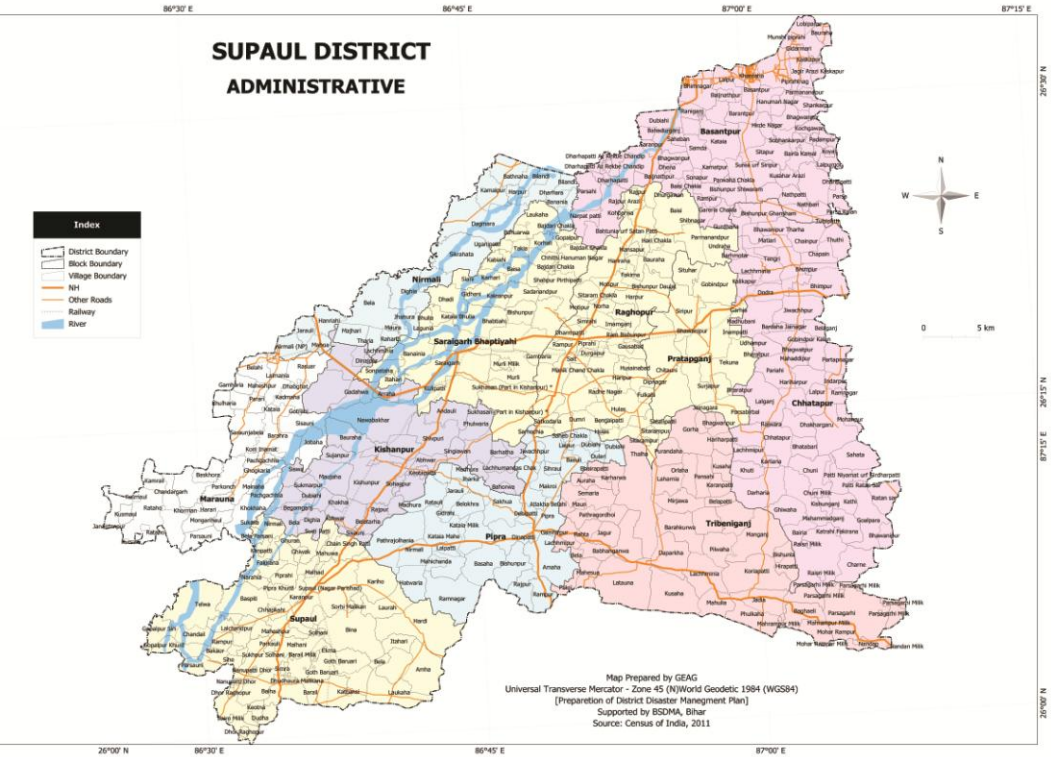
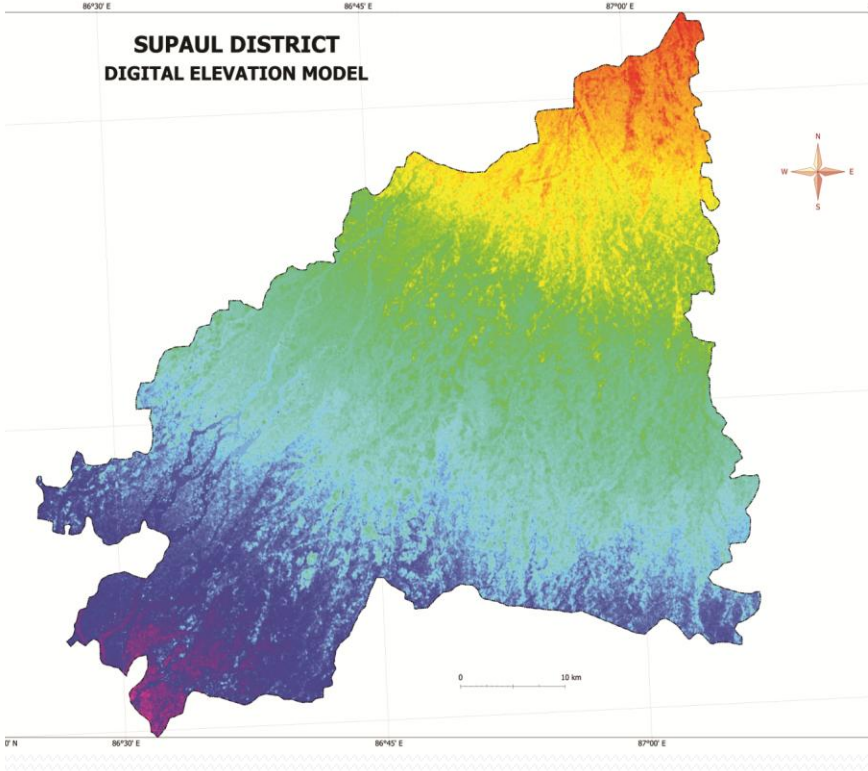
54.00 - 55.00
55.00 - 56.00
56.00 - 57.00
57.00 - 58.00
58.00 - 59.00
59.00 - 60.00
>60.00
N
W
E
S
0
10 km
86°45' E
87°00' E
26°00' N
25°45' N
25°30' N


SUPAUL DISTRICT
ADMINISTRATIVE
Index
District Boundary
Block Boundary
Village Boundary
NH
Other Roads
Railway
River
Nirmali
Saraigarh Bhaptiyahi
Kishanpur
Marsuna
Supaul
Pipra
Raghopur
Basantpur
Pratapganj
Chhatapur
Tribeniganj
0 5 km
Map Prepared by GEAG
Universal Transverse Mercator - Zone 45 (N)World Geodetic 1984 (WGS84)
[Preparation of District Disaster Manegment Plan]
Supported by BSDMA, Bihar
Source: Census of India, 2011


SUPAUL DISTRICT
DIGITAL ELEVATION MODEL
0 10 km

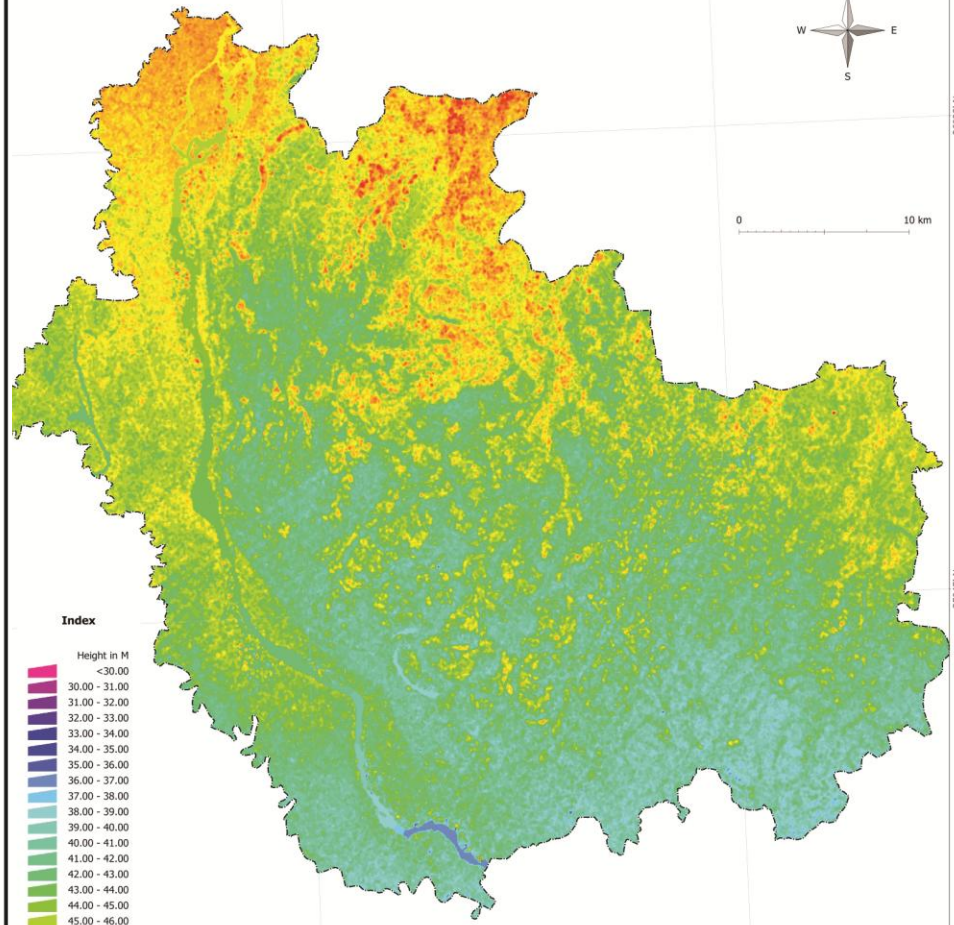
SAHARSA DISTRICT

ADMINISTRATIVE

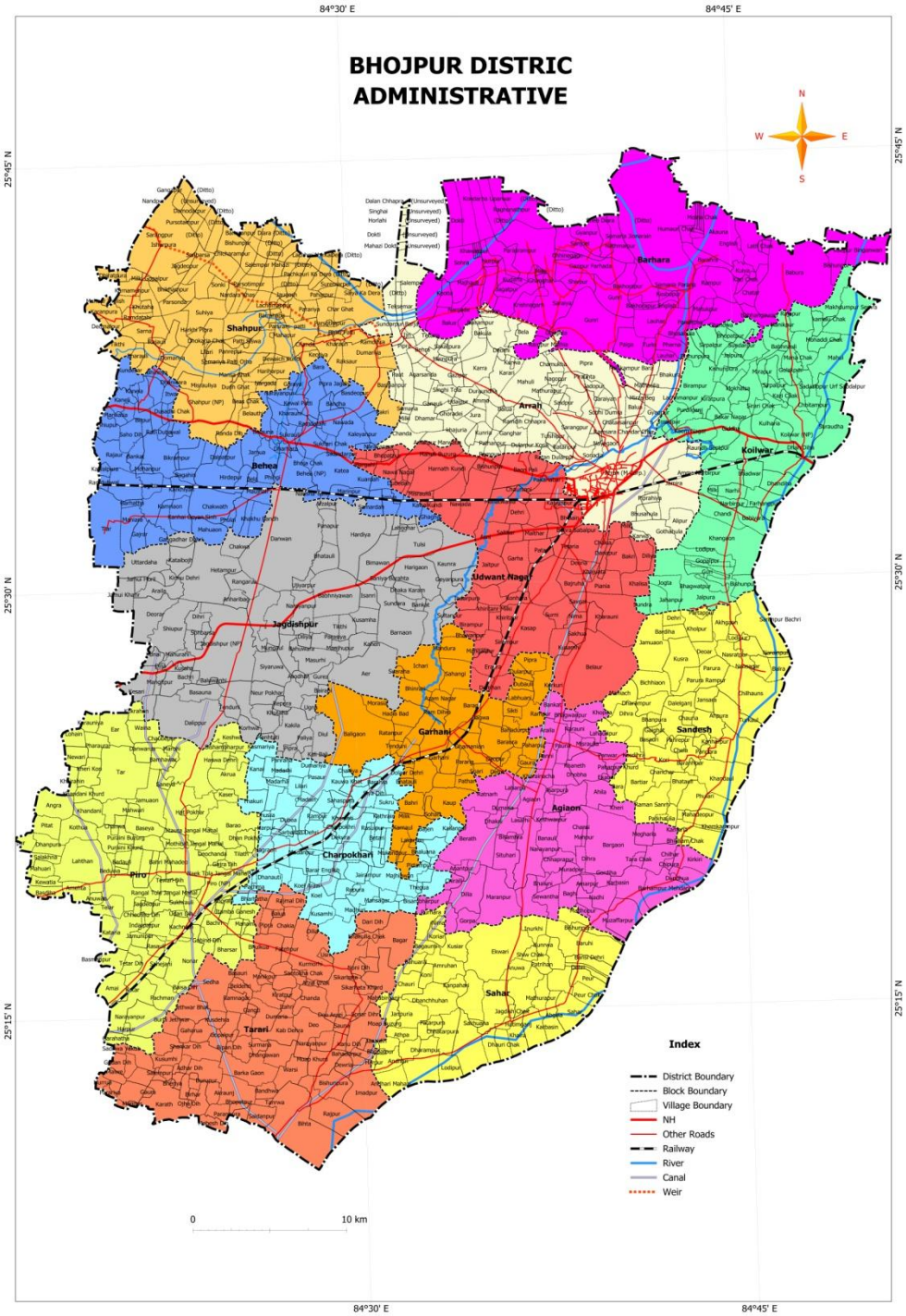
Map Prepared by GEAG
Universal Transverse Mercator - Zone 45 (N)World Geodetic 1984 (WGS84)
[Preparetion of District Disaster Manegment Plan]
Supported by BSDMA, Bihar
Source: Census of India, 2011

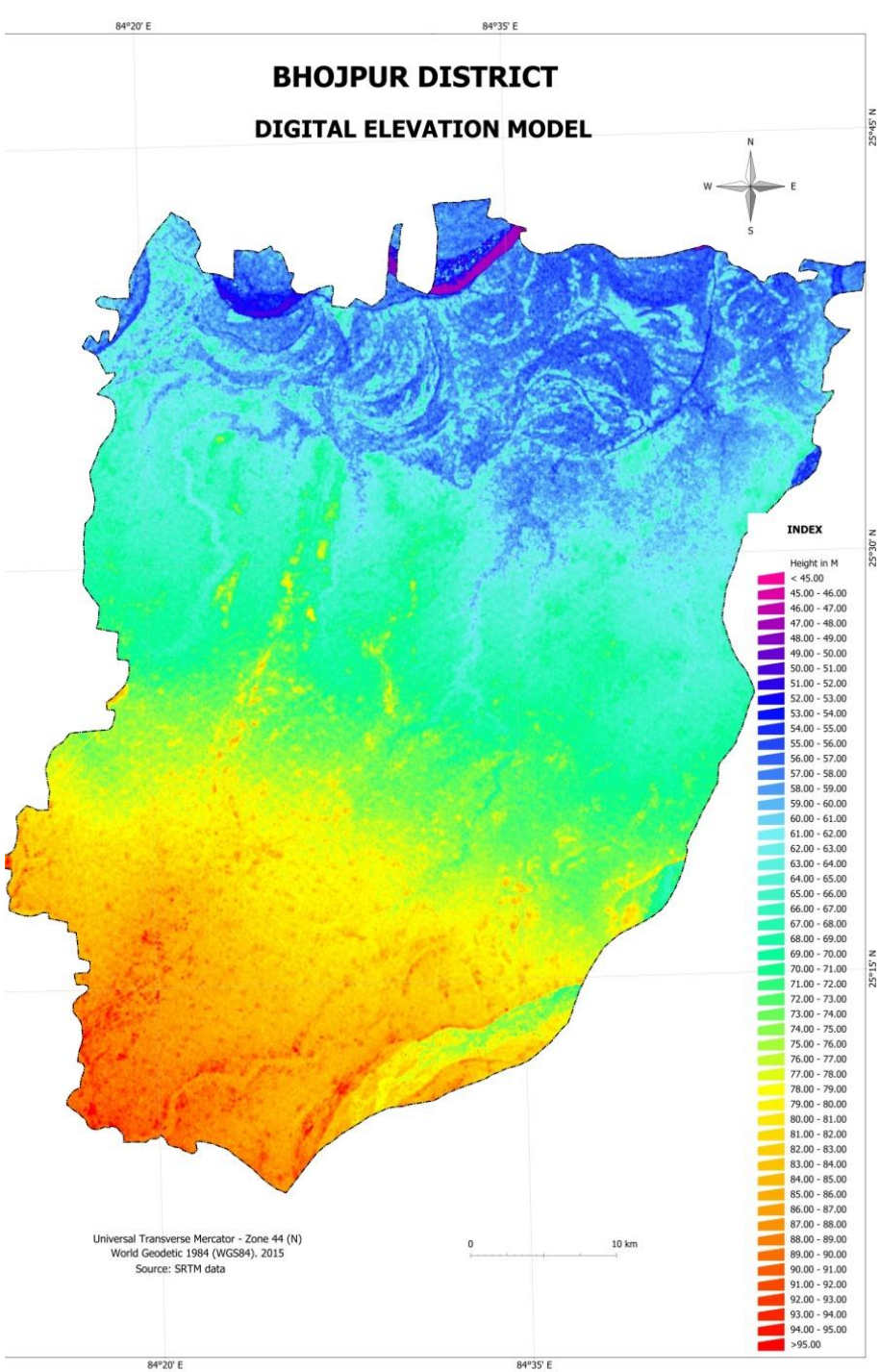
SAHARSA DISTRICT

DIGITAL ELEVATION MODEL



Universal Transverse Mercator - Zone 44 (N)
World Geodetic 1984 (WGS84), 2015
Source: SRTM Data


BHOJPUR DISTRIC
ADMINISTRATIVE
84°30' E
84°45' E
25°45' N
25°30' N
25°15' N
N
W
E
S
Barhara
Shahpur
Arrah
Koilwar
Behea
Udwant Nagar
Jagdishpur
Garhani
Sandesh
Agiaon
Charpokhari
Piro
Sahar
Tarari
Index
District Boundary
Block Boundary
Village Boundary
NH
Other Roads
Railway
River
Canal
Weir
0
10 km


BHOJPUR DISTRICT
DIGITAL ELEVATION MODEL
84°20' E
84°35' E
25°45' N
25°30' N
25°15' N
N
W
E
S
INDEX
Height in M
< 45.00
45.00 - 46.00
46.00 - 47.00
47.00 - 48.00
48.00 - 49.00
49.00 - 50.00
50.00 - 51.00
51.00 - 52.00
52.00 - 53.00
53.00 - 54.00
54.00 - 55.00
55.00 - 56.00
56.00 - 57.00
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68.00 - 69.00
69.00 - 70.00
70.00 - 71.00
71.00 - 72.00
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73.00 - 74.00
74.00 - 75.00
75.00 - 76.00
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77.00 - 78.00
78.00 - 79.00
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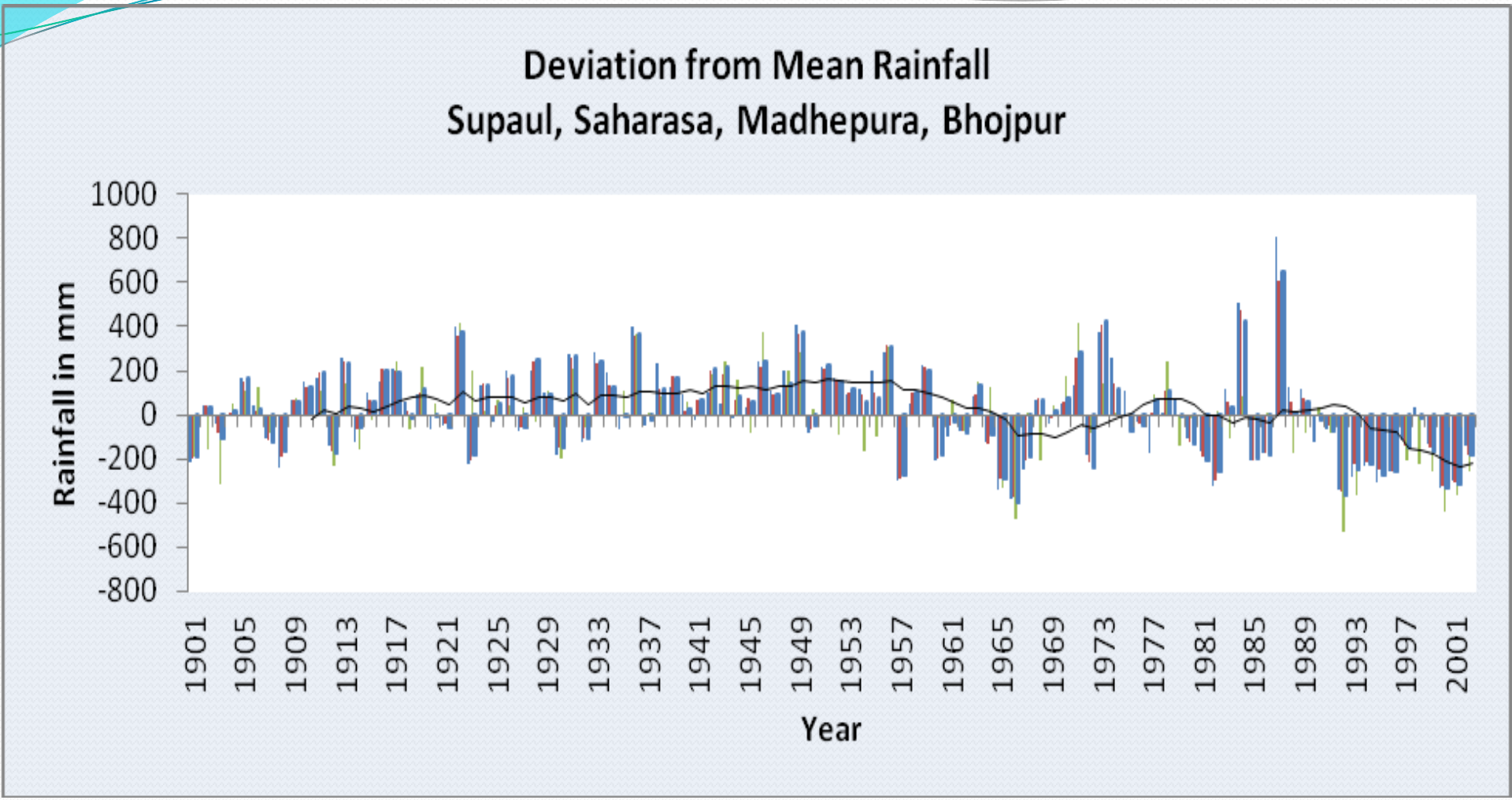
81.00 - 82.00
82.00 - 83.00
83.00 - 84.00
84.00 - 85.00
85.00 - 86.00
86.00 - 87.00
87.00 - 88.00
88.00 - 89.00
89.00 - 90.00
90.00 - 91.00
91.00 - 92.00
92.00 - 93.00
93.00 - 94.00
94.00 - 95.00
>95.00
Universal Transverse Mercator - Zone 44 (N)
World Geodetic 1984 (WGS84). 2015
Source: SRTM data
0
10 km


Deviation from Mean Rainfall
Supaul, Saharasa, Madhepura, Bhojpur
Rainfall in mm
1000
800
600
400
200
0
-200
-400
-600
-800
1901
1905
1909
1913
1917
1921
1925
1929
1933
1937
1941
1945
1949
1953
1957
1961
1965
1969
1973
1977
1981
1985
1989
1993
1997
2001
Year

Projected Maximum Temperature in (o C) 2040

Station	Pre Monsoon Season	Monsoon Season	Post Monsoon Season	Winter Season
Saharasa	0.3 to 0.7	0.4 to 0.8	-0.26 to 0.34	0.22 to 0.85
Supaul	0.19 to 0.31	0.24 to 0.76	.01 to 0.42	.10 to 0.79
Madhepura	0.18 to 0.50	.03 to .70	-0.35 to .45	.09 to .65
Bhojpur	0.16 to 0.42	.06 to .67	-.01 to 0.16	.08 to 0.59

Projected Minimum Temperature in (o C) 2040				
Station	**Pre Monsoon Season**	**Monsoon Season**	**Post Monsoon Season**	**Winter Season**
Saharasa	0.19 to 0.47	0.22 to 0.63	-0.33 to 0.27	-0.34 to 0.43
Supaul	0.21 to 0.39	0.20 to 0.59	-0.03 to 0.19	0.19 to 0.42
Madhepura	0.22 to 0.41	0.23 to 0.47	-0.06 to 0.25	0.21 to 0.57
Bhojpur	0.19 to 0.73	0.18 to 0.69	-0.08 to 0.28	0.14 to 0.51

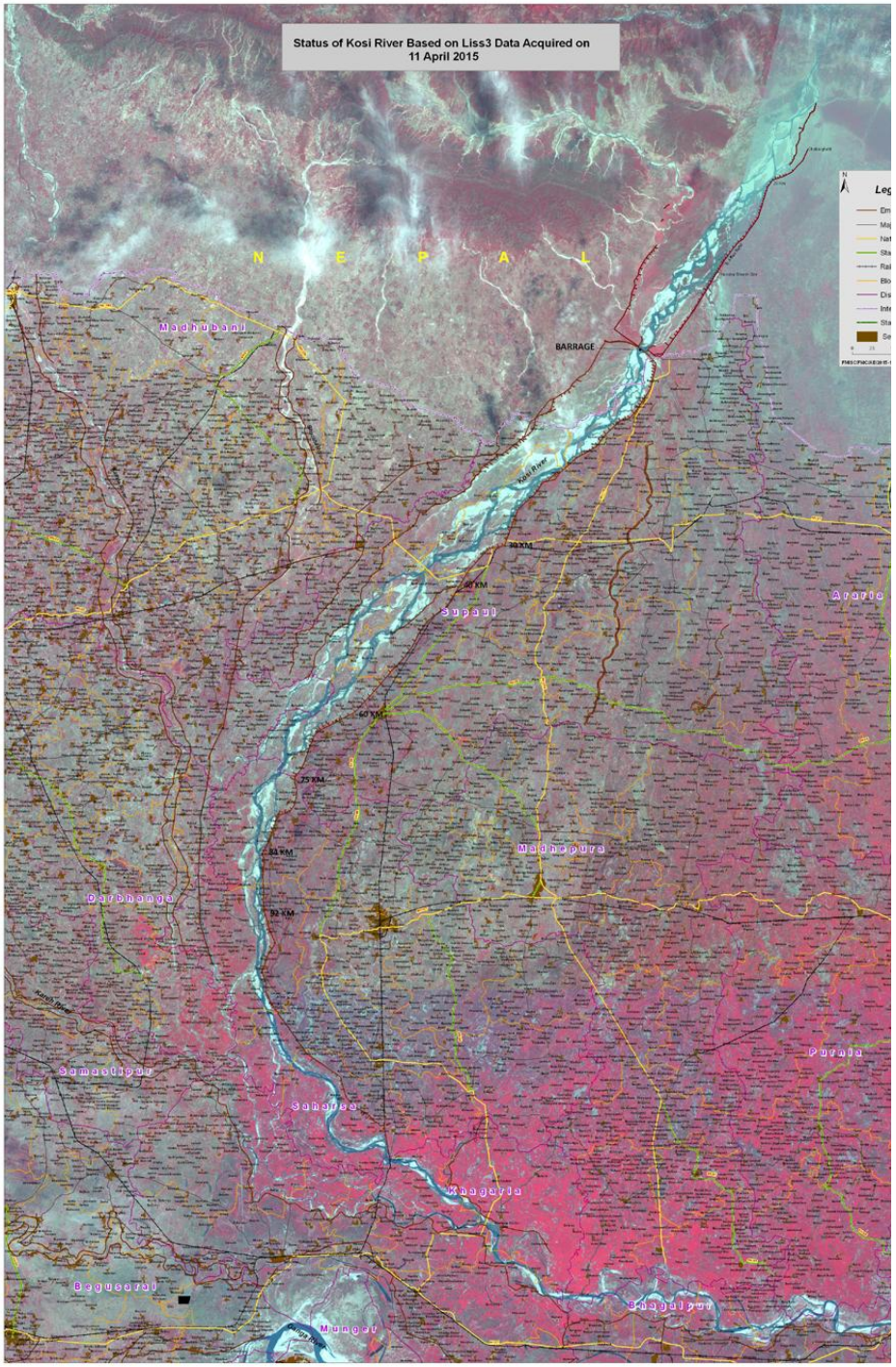
Source : CMIP -5 Downscaled data

Flooding characteristics of surveyed Districts

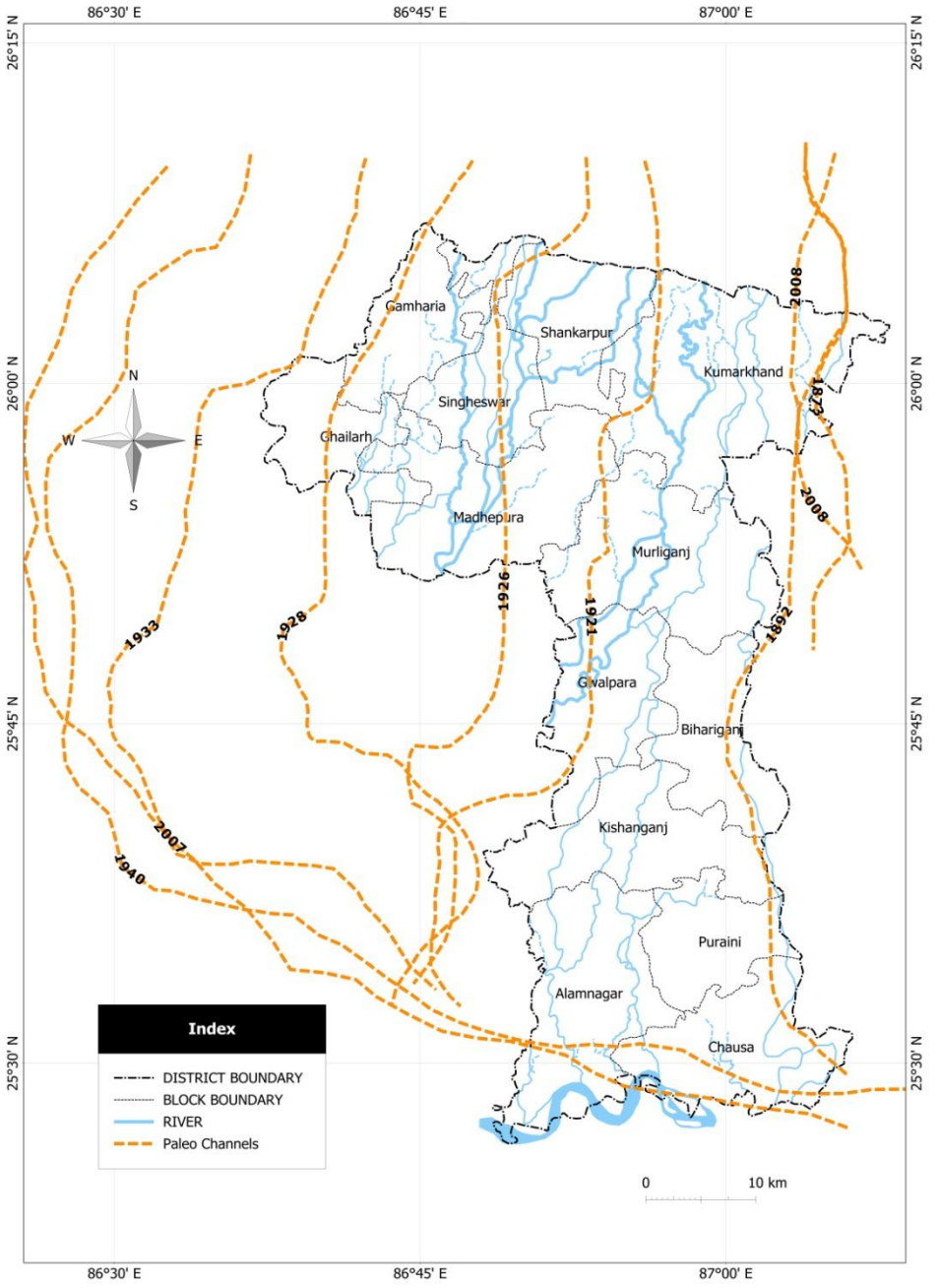
District	Flood affected Panchayats	Flood affected villages	Flood affected population	% of flood affected areas
Supaul	36	130	309222	30.75
Madhepura	140	370	1419856	50.45
Saharsa	40	129	398468	46.54
Bhojpur				3.43

District-wise cropped area (in percent) in different flood hazard zones

District	Very High	High	Medium	low	Very low	Total cropped areas
Supaul	0.01	0.24	1.40	6.0	92.0	51181
Madhepura	4	5	6	8	77	80210
Saharsa	4	5	17	20	51	63267
Bhojpur	0	0	0	0	100	3684

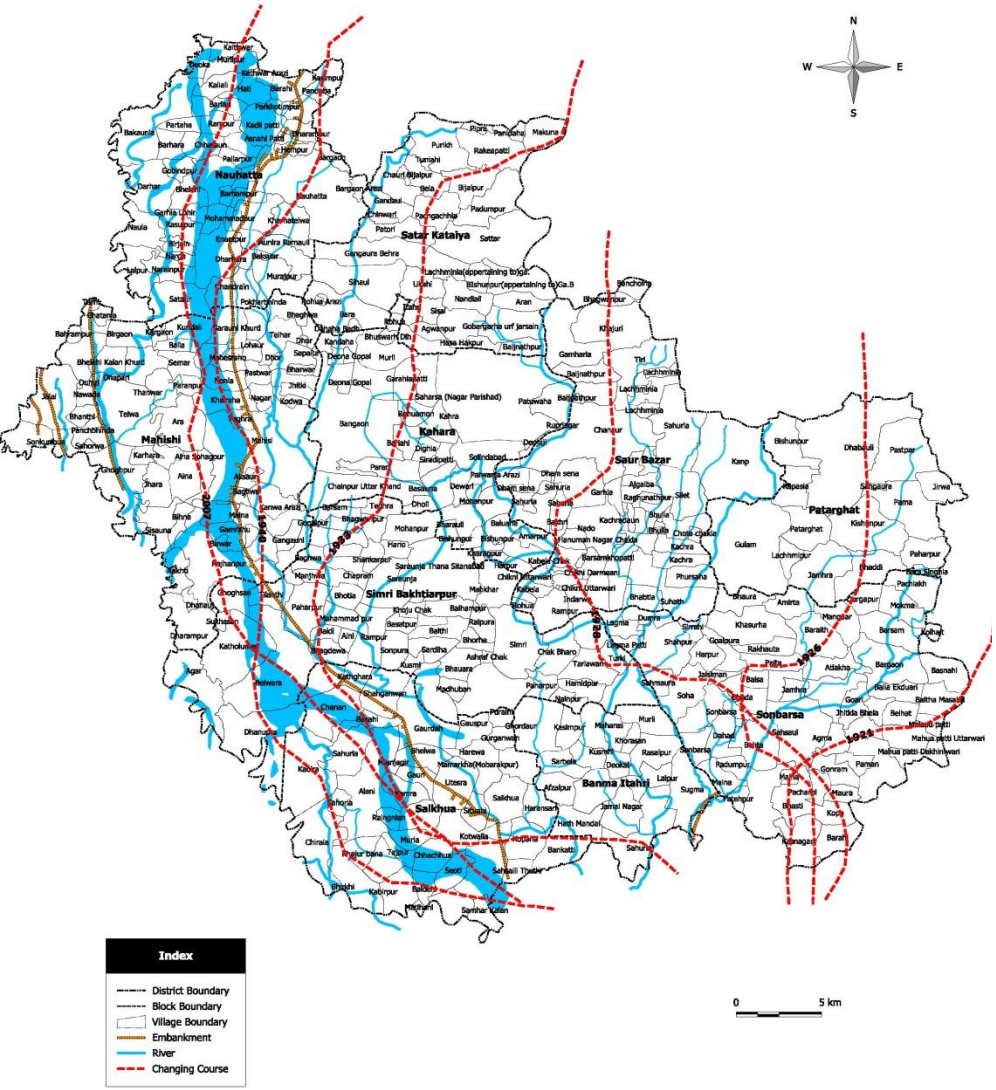


MADHEPURA DISTRICT
EXISTING DRAINS AND PALEO CHNNELS OF KOSI RIVER



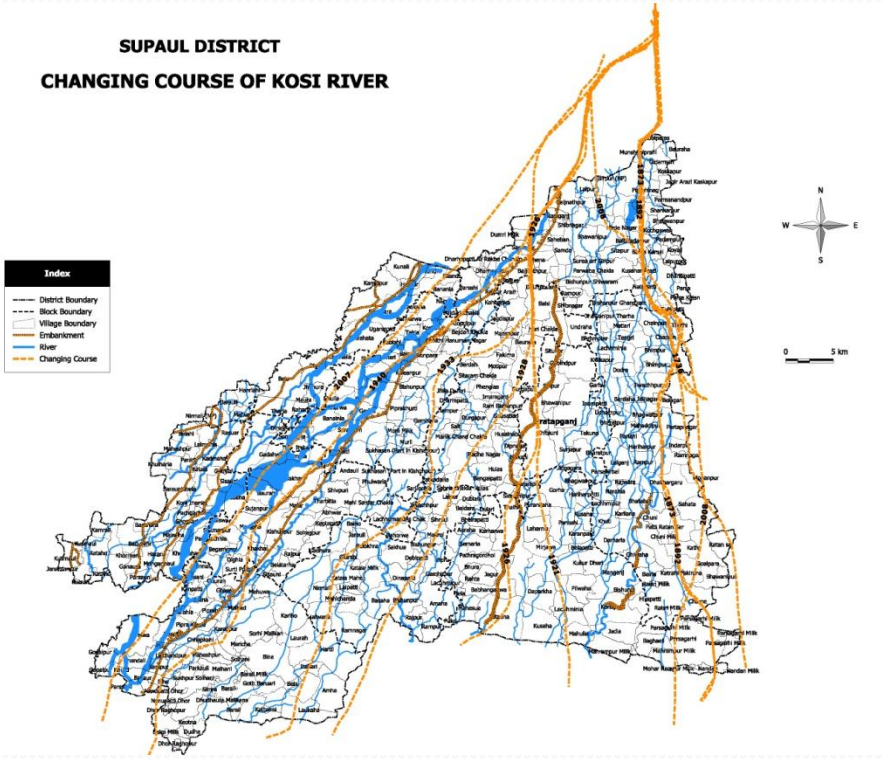
SAHARSA DISTRICT

CHANGING COURSE OF KOSI RIVER



SUPAUL DISTRICT

CHANGING COURSE OF KOSI RIVER

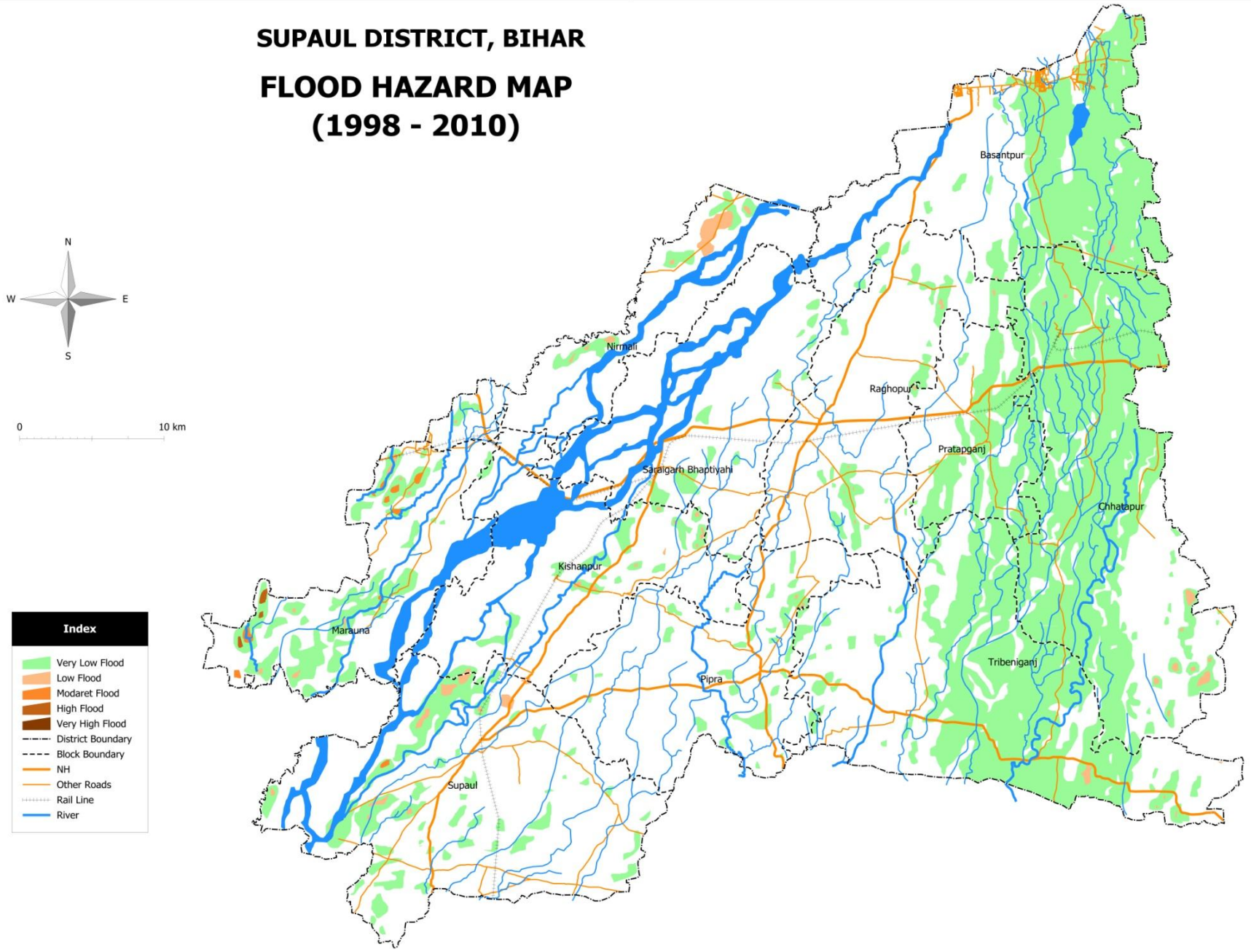


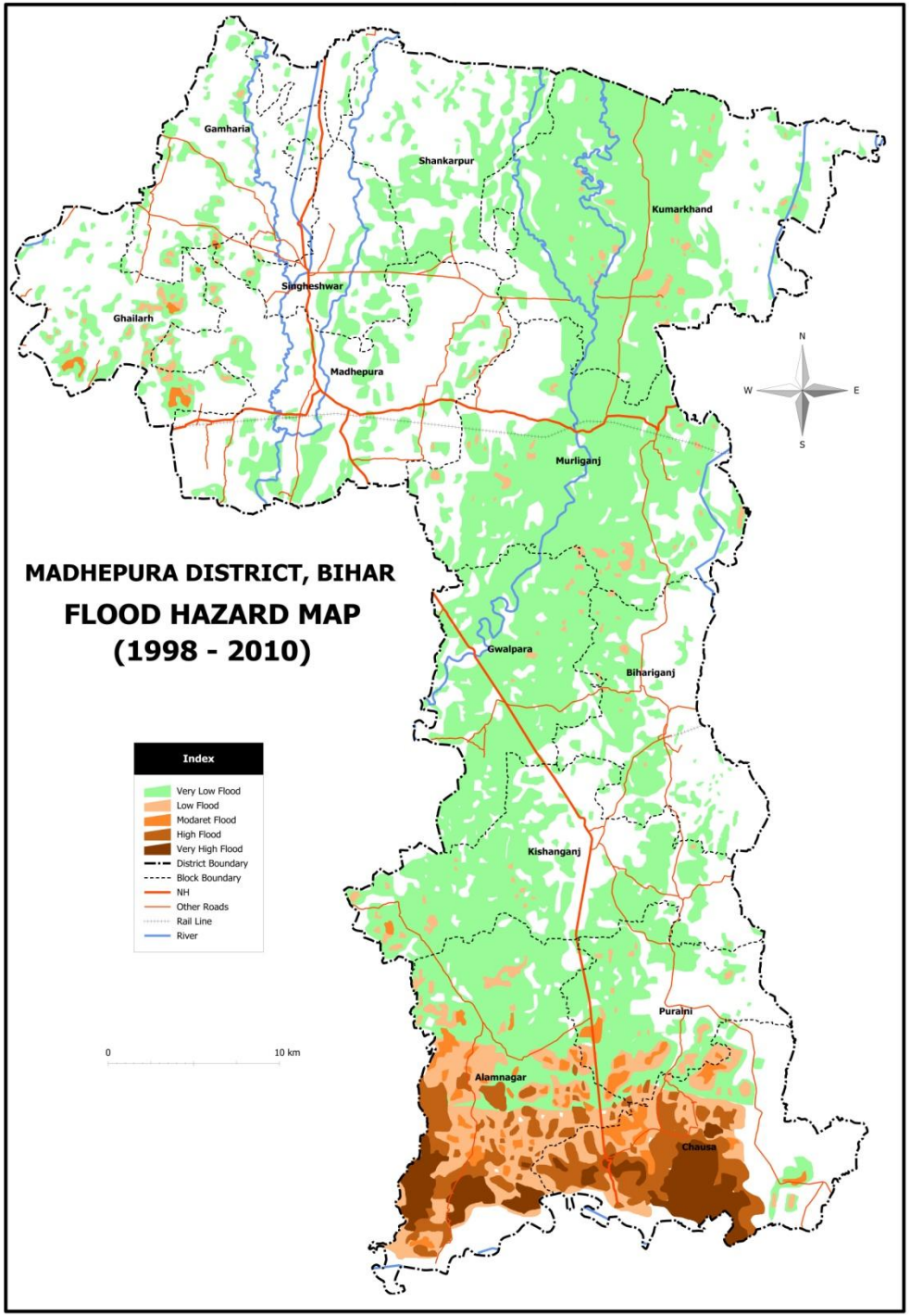
Frequency of drought & flood years in surveyed district

District	Years	Freq	Flood	Freq
Supaul	1992,2001	2	2005,2006,2007, 2008,2009,2010, 2011, 2012, 2013	9
Madhepura	1966,1970,1971,1972,1982 ,2001,2009	7	2006,2007,2008, 2010,2011	5
Saharsa	1966,1971,1972,1979,1982 ,1992,2001	7	2005,2006,2007, 2008,2009,2010, 2011,2012, 2013	9
Bhojpur	1966,1970,1971,1972,1979 ,1981,1982,2001, 2004,2009,2010	11	2008,2010, 2011	3

SUPAUL DISTRICT, BIHAR

FLOOD HAZARD MAP
(1998 - 2010)

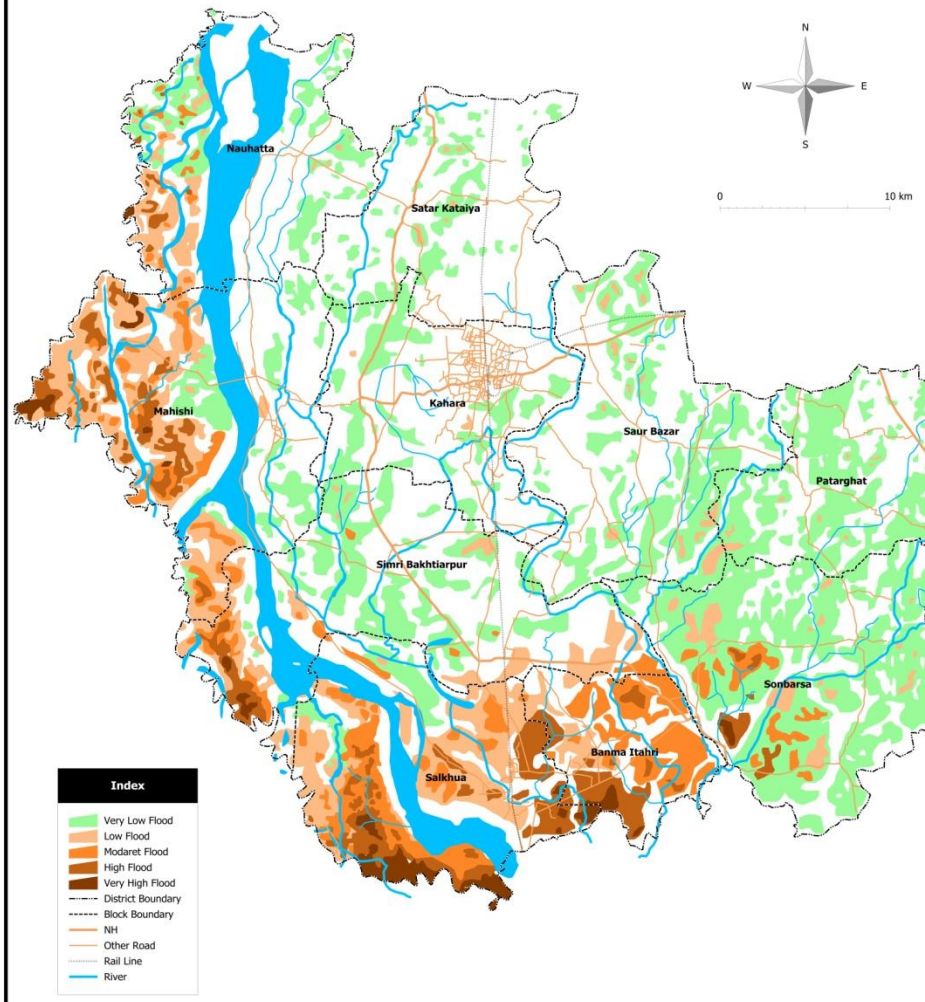




MADHEPURA DISTRICT, BIHAR

FLOOD HAZARD MAP

(1998 - 2010)



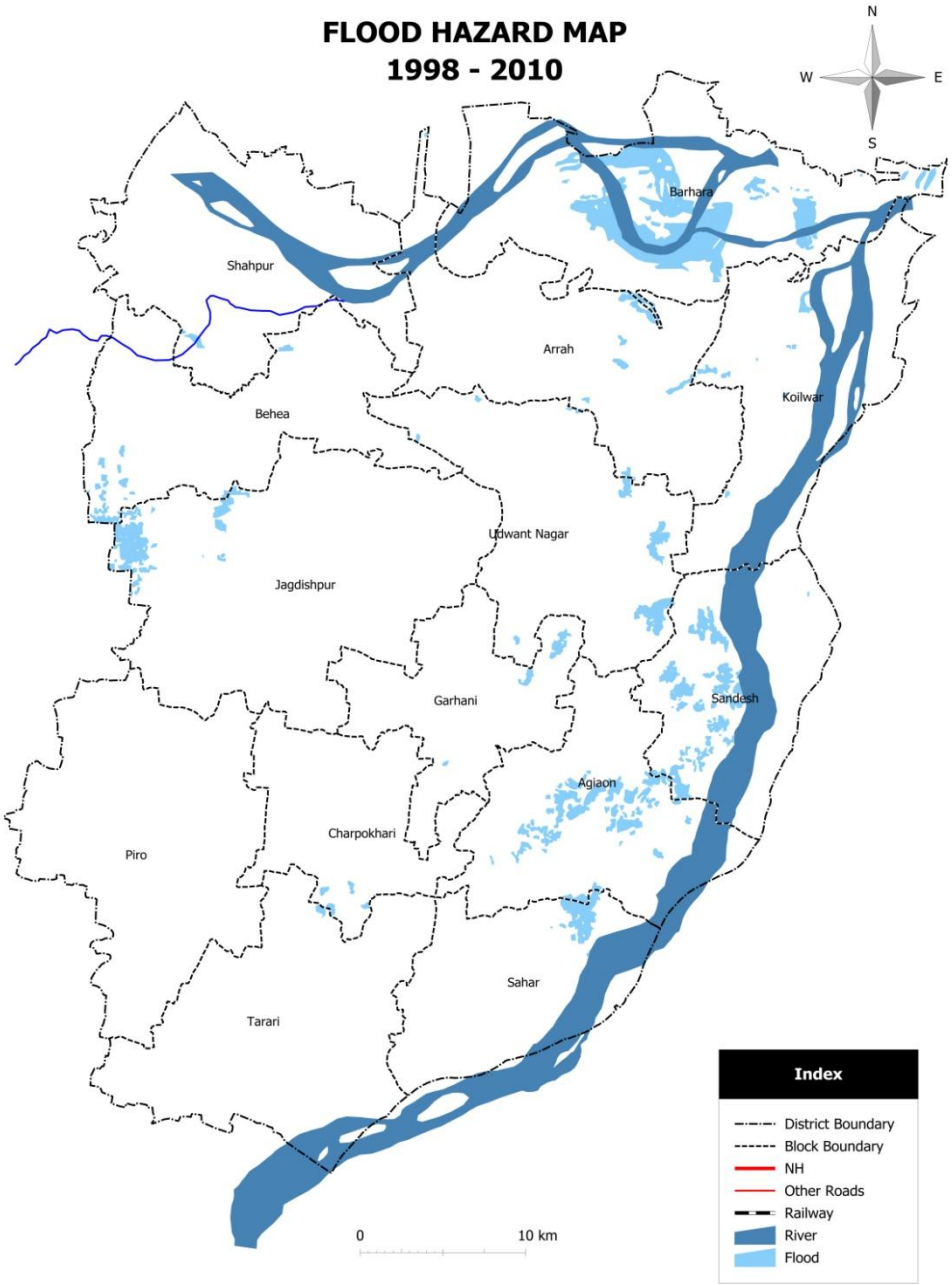
SAHARSA DISTIRCT, BIHAR

FLOOD HAZARD MAP

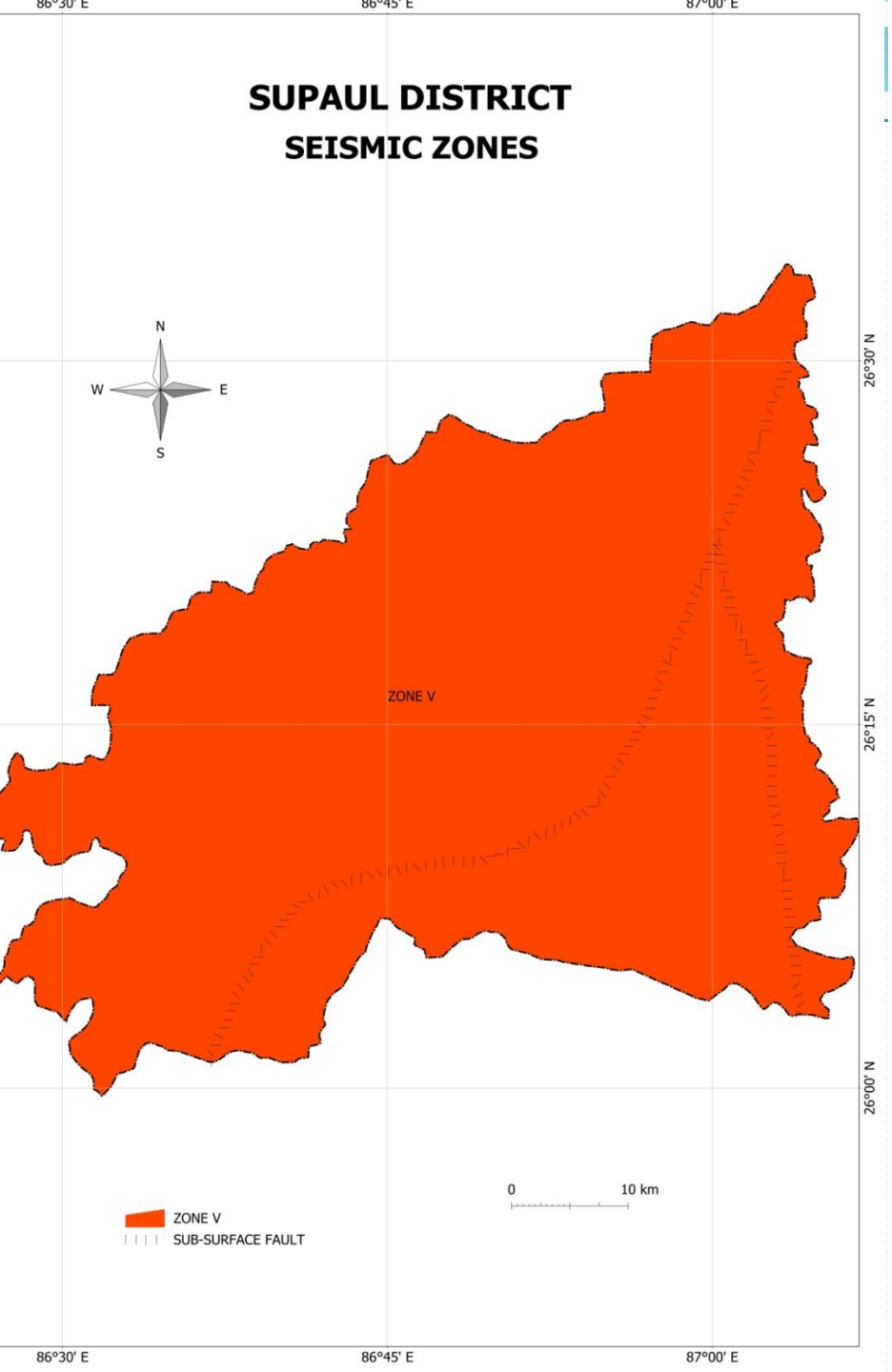
(1998 - 2010)

BHOJPUR DISTRICT

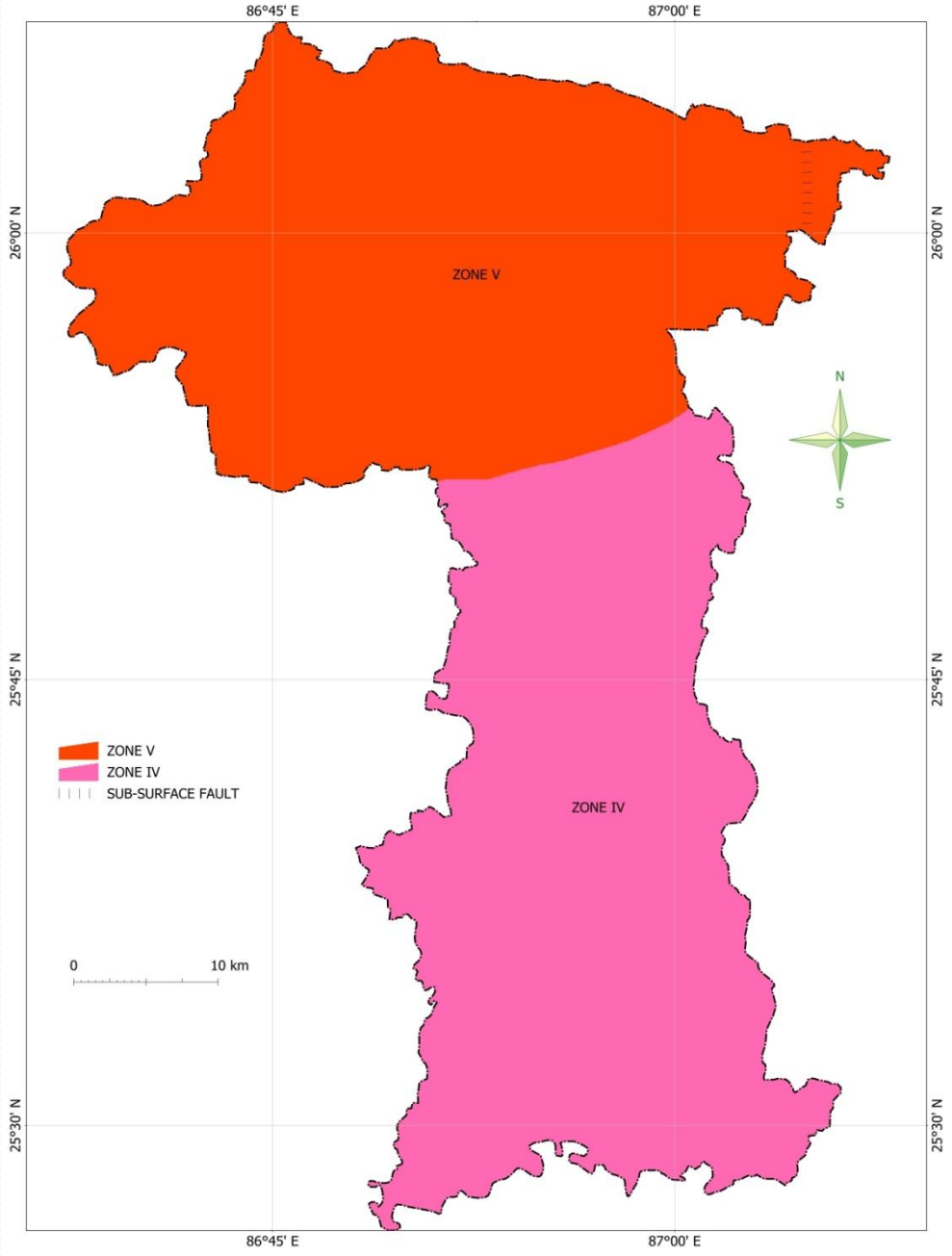
FLOOD HAZARD MAP
1998 - 2010

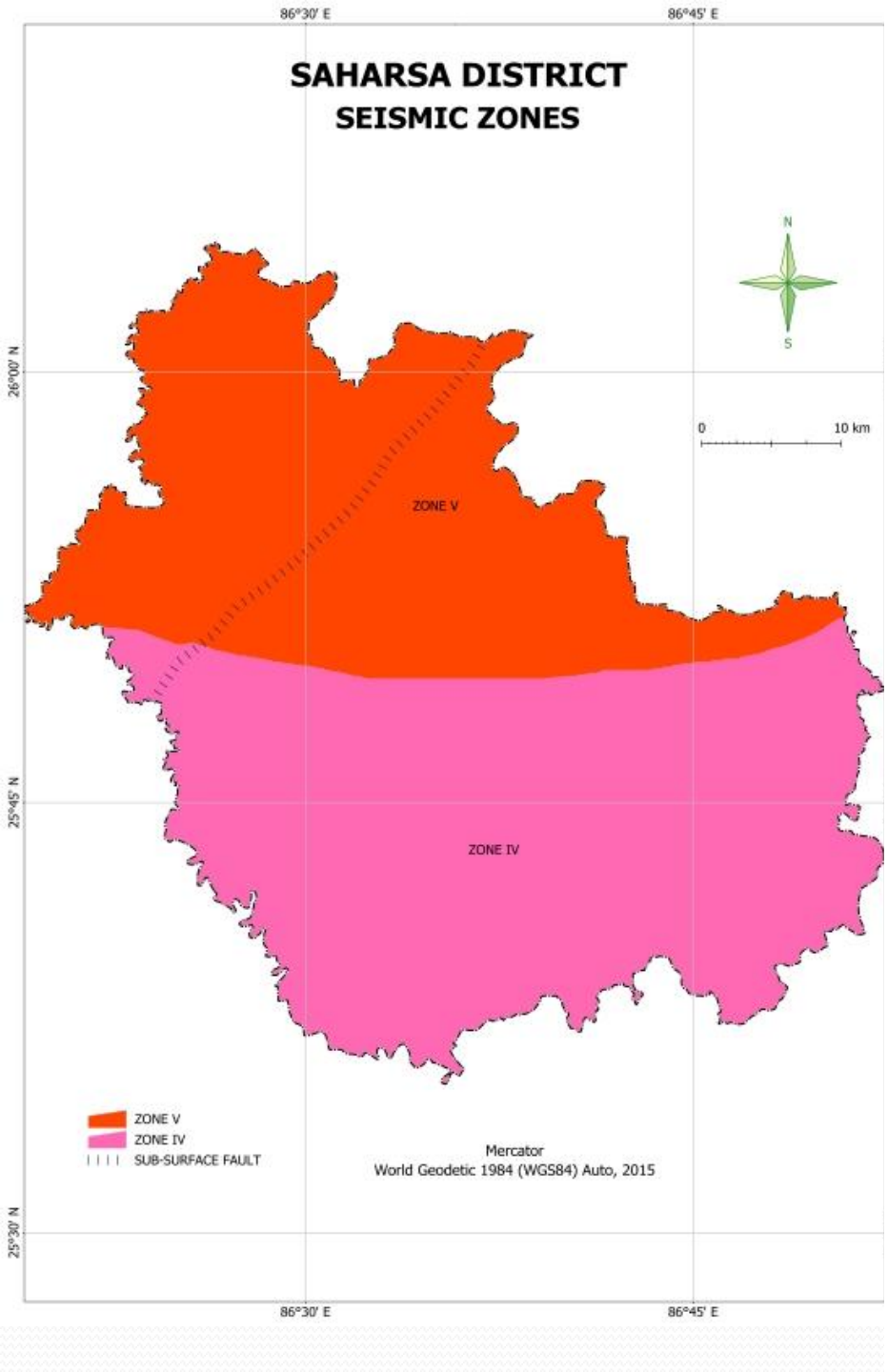


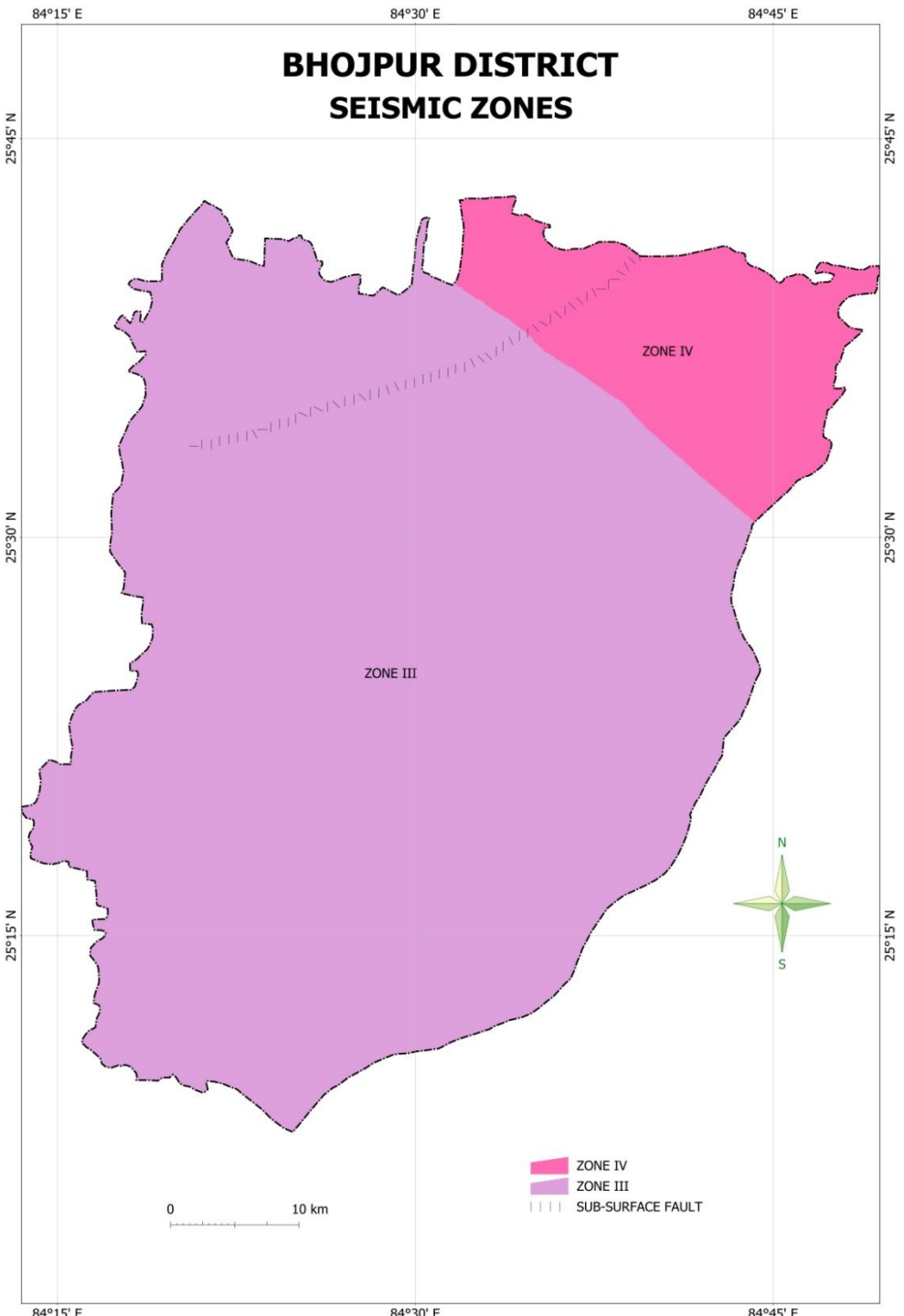
SUPAUL DISTRICT
SEISMIC ZONES



MADHEPURA DISTRICT
SEISMIC ZONES




SAHARSA DISTRICT
SEISMIC ZONES
86°30' E
86°45' E
26°00' N
25°45' N
25°30' N
N
S
0
10 km
ZONE V
ZONE IV
ZONE V
ZONE IV
SUB-SURFACE FAULT
Mercator
World Geodetic 1984 (WGS84) Auto, 2015


BHOJPUR DISTRICT
SEISMIC ZONES
84°15' E
84°30' E
84°45' E
25°45' N
25°30' N
25°15' N
ZONE IV
ZONE III
N
S
0
10 km
ZONE IV
ZONE III
SUB-SURFACE FAULT

Hypothetical Earthquake Damage scenario (Based on 1934 earthquake intensity)

Level of vulnerability at block level

Life losses scenario during favorable condition

Life losses scenario during Unfavorable condition

. Distribution of Houses by Predominant Materials of Roof and Wall and Level of Damage Risk in Bhojpur district

Wall/ roof	R/U	Census Houses		Level of Risk under								Flood proneness in %
				EQ zone				Wind velocity m/s				
		No of Houses	%	V	IV	III	II	55-50	47	46-39		
				Area in %				Area in %				
A1 Mud and unburnt brick wall	R	96435	23.2									
	U	8889	2.13									
	T	105324	25.34		H	M			H			H
A2 -Stone wall	R	18897	4.54									
	U	4528	1.08									
	T	23425	5.63		H	M			M			H
Total category A		128749	30.89									
B Burnt brick wall	R	213735	51.43									
	U	41574	10.00									
Total category B		255309	61.43		M	L			M			H/M
C1 Concrete wall	R	2977	0.71									
	U	899	0.21									
	T	3876	0.93		L	VL			L			L/VL
C2 wood wall	R	942	0.22									
	U	97	0.02									
	T	1039	0.25		L	VL			H			H
Total C		4915	1.18									
X –other category	R	24796	5.96									
	U	1786	0.42									
Total category X	T	26582	6.39		VL	VL			H			H
Total Buildings		415555										
R1- Light weight sloping roof	R	84556	2.34									
	U	9050	2.17									
	T	93606	22.52		M	L			VH			M
R2- Heavy weight sloping roof	R	211459	50.88									
	U	15296	3.68									
	T	226755	54.56		M	L			M			M
R3 – Flat Roof	R	61765	14.86									
	U	33427	8.04									
	T	95192	22.66	Damage risk as per that for the wall supporting it								

Distribution of Houses by Predominant Materials of Roof and Wall and Level of Damage Risk in Madhepura district

Wall/ roof		Census Houses 2011		Level of risk under								Flood proneness in %
		No of Houses	%	EQ zone				Wind velocity m/s				
				V	IV	III	II	55-50	47	46-39		
				Area in %				Area in %				
A1	R	23497	5.86									
Mud and unburnt brick wall	U	1117	0.28									
	T	24614	6.13	H	H				H			VH
A2 -Stone wall	R	2514	0.63									
	U	360	0.09									
	T	2874	0.72	H	H				M			VH
Total category A		27488	6.85									
B Burnt brick wall	R	112210	27.98									
	U	8531	2.12									
Total category B		120741	30.11	H	M				M			H/M
C1 Concrete wall	R	1016	0.25									
	U	98	0.02									
	T	1114	0.27	M	M				L			L/VL
C2 wood wall	R	485	0.12									
	U	37	0.01									
	T			M	L				H			H
Total C		1636	0.41									
X –other category	R	244070	60.86									
	U	7066	1.76									
Total category X	T	251136	62.63	M	L				H			VH
Total Buildings		401001										
R1- Light weight sloping roof	R	274504	68.45									
	U	7402	1.84									
	T	281906		M	M				H			VH
R2- Heavy weight sloping roof	R	59912	14.94									
	U	3979	0.99									
	T	63891		H	M				M			H
R3 – Flat Roof	R	49376	12.31									
	U	5828	1.45									
	T	55204		Damage risk as per that for the wall supporting it								

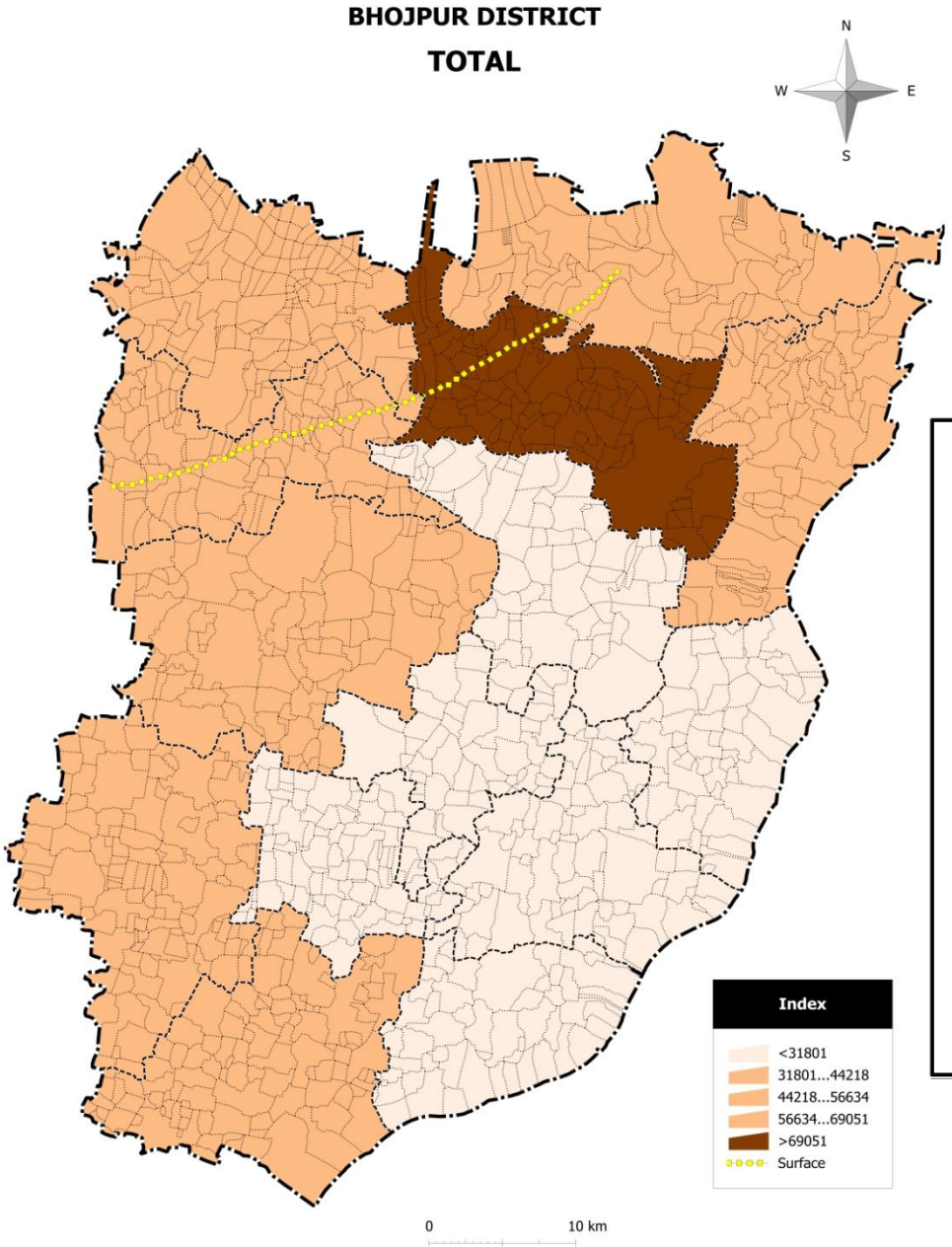
Distribution of Houses by Predominant Materials of Roof and Wall and Level of Damage Risk

SHAHARSA DISTRICT (Source: Vulnerability Atlas of India, 2006)

Wall/ Roof		Census Houses		Level of risk under								Flood pronenness in %
		No of Houses	%	EQ zone				Wind velocity m/s				
				V	IV	III	II	55-50	47	46-39		
				Area in %				Area in %				
A1	R	39162	10.60									
Mud and unburnt brick wall	U	6195	1.68									
	T	45357	12.31	H	H				H			VH
A2 -Stone wall	R	1765	0.47									
	U	470	0.12									
	T	2235	0.60	H	H				M			H
Total category A		47592	12.92									
B Burnt brick wall	R	124872	33.91									
	U	19424	5.27									
Total category B		144296	39.18	H	M				M			H/M
C1 Concrete wall	R	935	0.25									
	U	258	0.07									
	T	1193	0.32	M	M				L			L/VL
C2 wood wall	R	769	0.20									
	U	56	0.01									
	T			M	L				H			H
Total C		2018	0.54									
X –other category	R	172273	46.78									
	U	2033	0.55									
Total category X	T	174306	47.33	M	L				H			VH
Total Buildings		368212										
R1- Light weight sloping roof	R	195630	53.12									
	U	5757	1.56									
	T			H	M				H			VH
R2- Heavy weight sloping roof	R	87714	23.82									
	U	10942	2.97									
	T			H	M				M			H
R3 – Flat Roof	R	56432	15.32									
	U	11737	3.18									
	T			Damage risk as per that for the wall supporting it								

Distribution of Houses by Predominant Materials of Roof and Wall and Level of Damage Risks District Supaul (Source : Vulnerability atlas of India, revised edition 2006)

Wall/ roof	R/U	Census Houses		Level of risk under								Flood proneness in %
				EQ zone				Wind velocity m/s				
		No of Houses	%	V	IV	III	II	55-50	47	46-39		
				Area in %				Area in %				
A1	R	16369	3.71									
Mud and unburnt brick wall	U	865	0.19									
	T	17234	3.90	H					H			VH
A2 -Stone wall	R	2078	0.47									
	U	125	0.02									
	T	2203	0.49	H					M			VH
Total category A		19477	4.40									
B Burnt brick wall	R	97196	22.05									
	U	9602	2.18									
Total category B		106798	24.22	M					M			H/M
C1 Concrete wall	R	1027	0.23									
	U	138	0.03									
	T	1165		L					L			L/VL
C2 wood wall	R	501	0.11									
	U	12	0.002									
	T	513		L					H			H
Total C		1678	0.38									
X –other category	R	303249	68.79									
	U	9642	2.18									
Total category X	T	312891	70.98	L								VH
Total Buildings		440804										
R1- Light weight sloping roof	R	356107	80.78									
	U	12653	2.87									
	T	368760		H								VH
R2- Heavy weight sloping roof	R	30463	6.91									
	U	1033	0.23									
	T	31496		H								H
R3 – Flat Roof	R	33850	7.68									
	U	6698	1.52									
	T	40548		Damage risk as per that for the wall supporting it								


BHOJPUR DISTRICT
TOTAL
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W
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Surface
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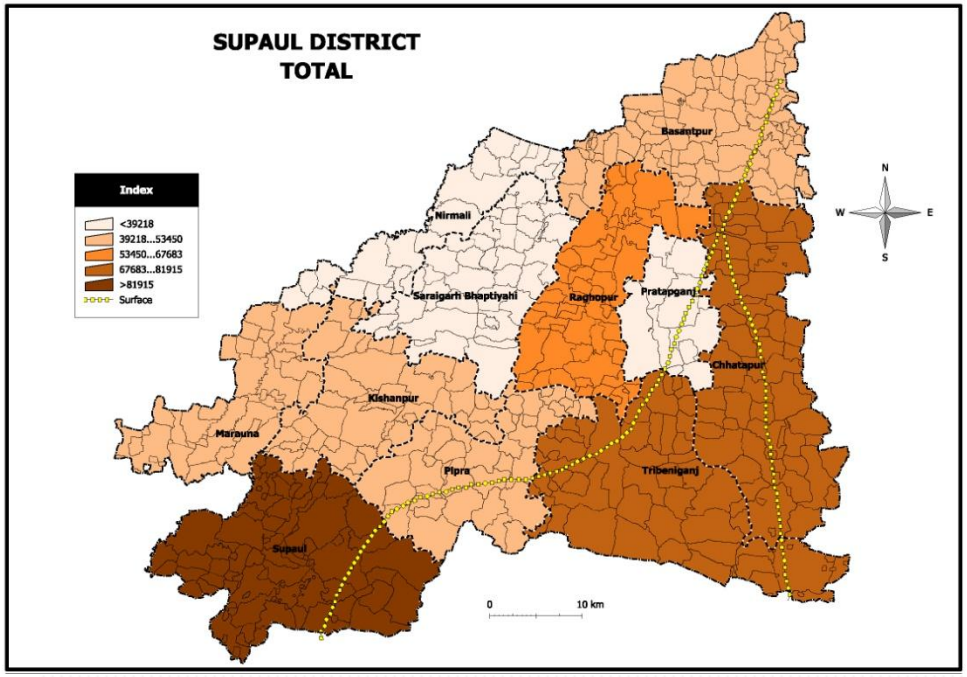
10 km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TOTAL
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Surface
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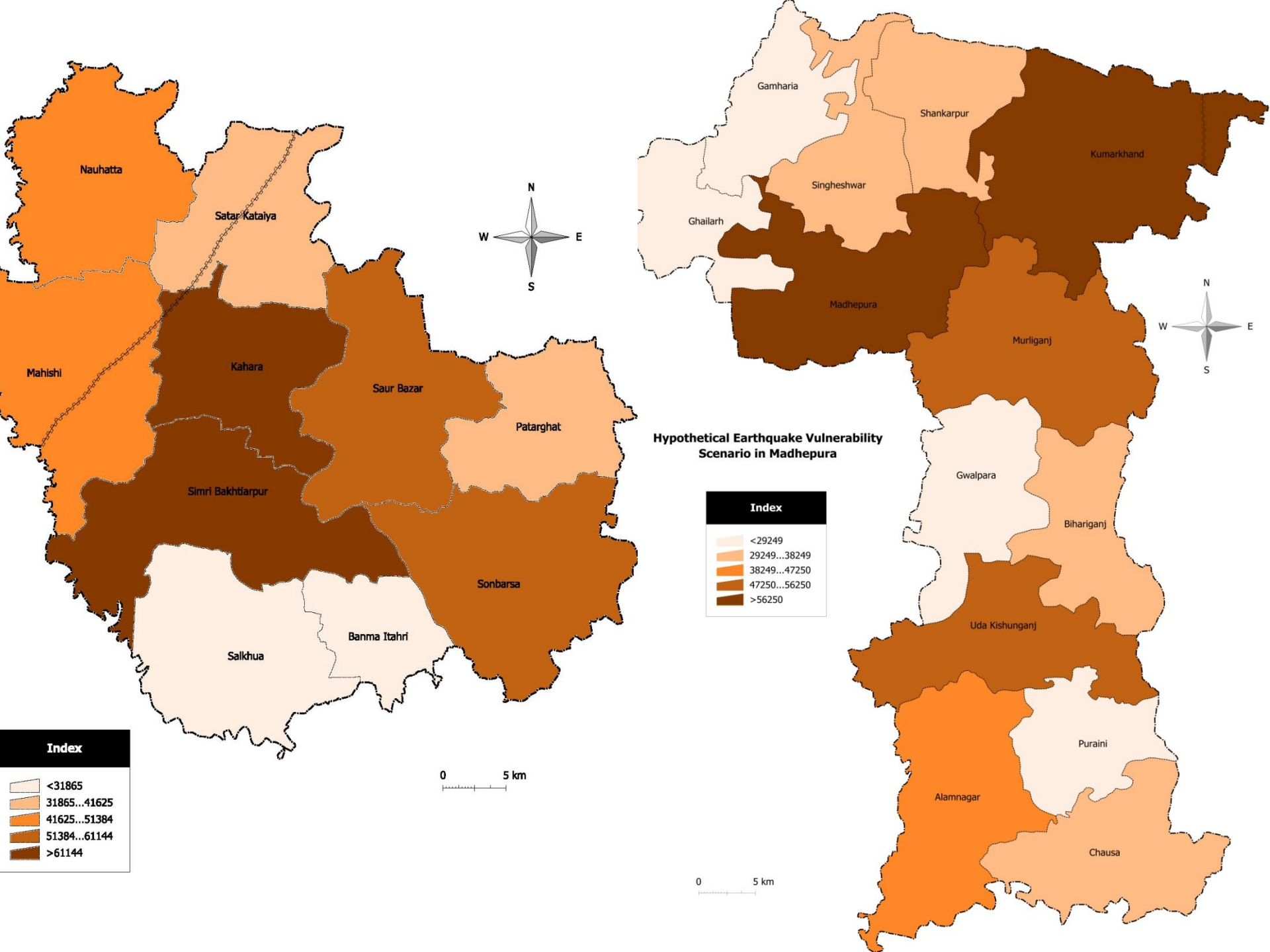
Nirmali
Saraigarh Bhaptiyahi
Raghopur
Pratapganj
Chhatapur
Kishanpur
Maraunа
Pipra
Tribeniganj
Supaul
N
W
E
S
0
10 km


Nauhatta
Satar Kataiya
Mahishi
Kahara
Saur Bazar
Patarghat
Simri Bakhtiarpur
Sonbarsa
Salkhua
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W
E
S
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5 km
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Gamharia
Shankarpur
Kumarkhand
Singheshwar
Ghailarh
Madhepura
Murliganj
Hypothetical Earthquake Vulnerability Scenario in Madhepura
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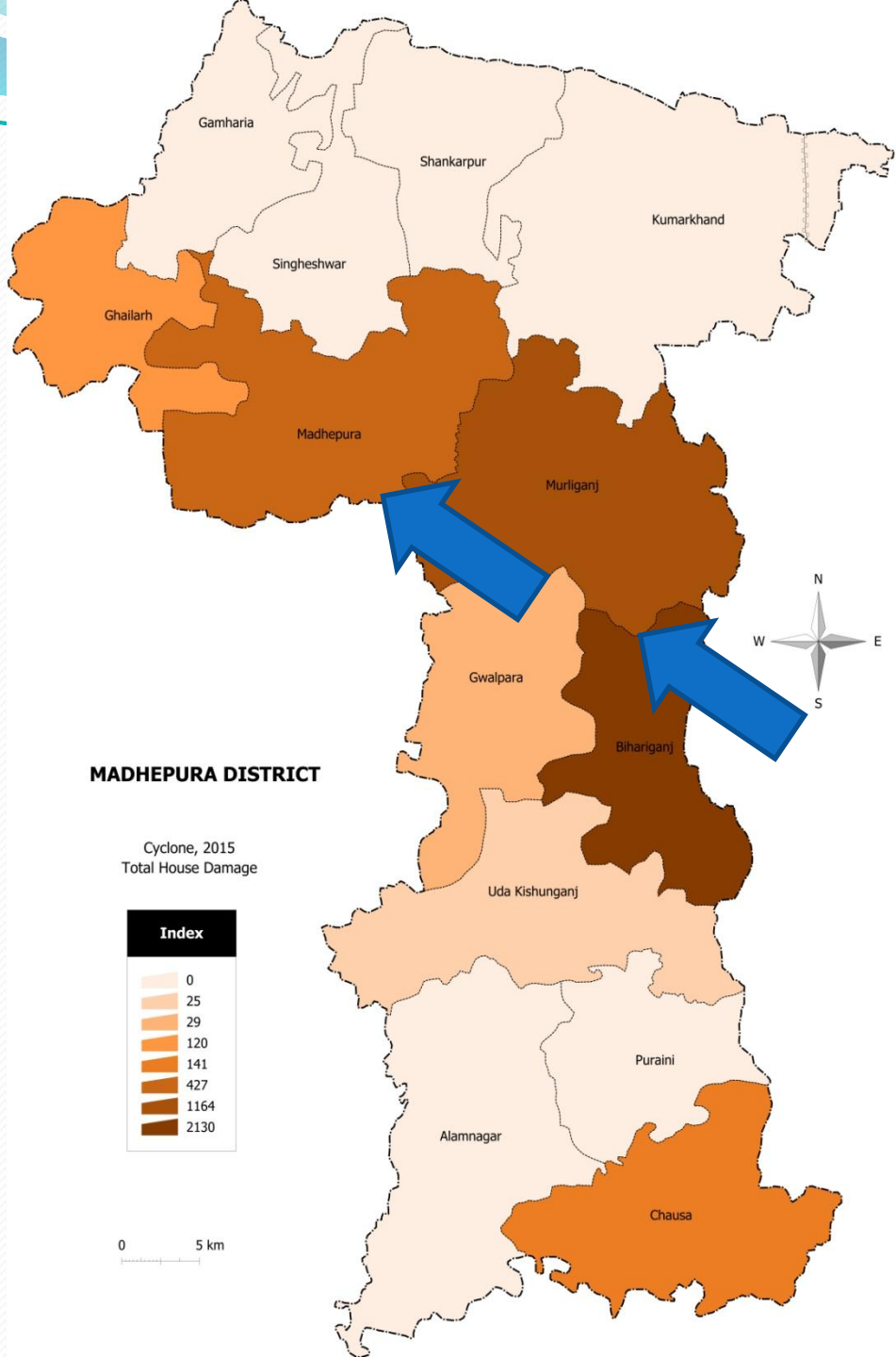
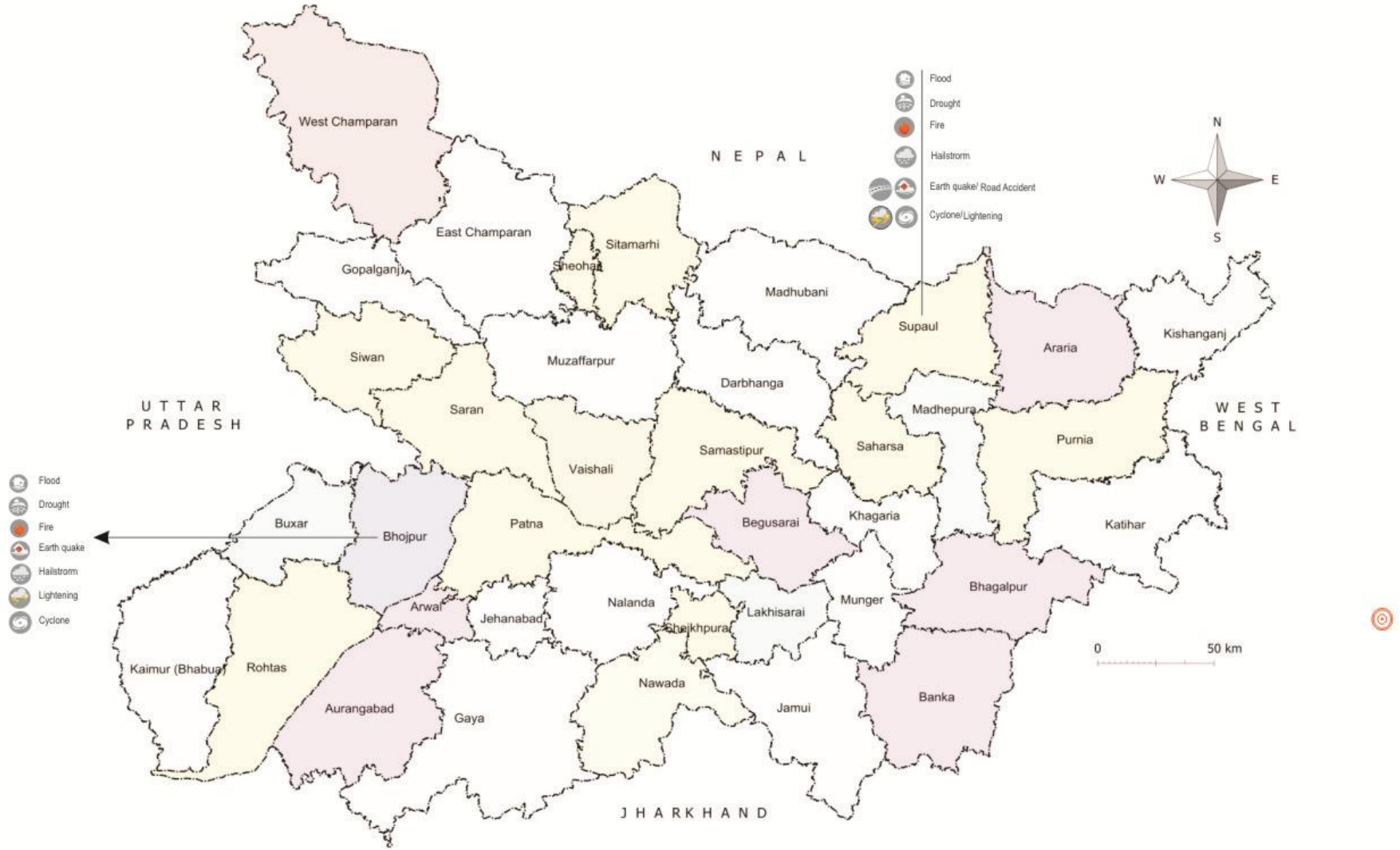
38249...47250
47250...56250
>56250
Gwalpara
Bihariganj
Uda Kishunganj
Puraini
Alamnagar
Chausa
N
W
E
S
0
5 km


Gamharia
Shankarpur
Kumarkhand
Singheshwar
Ghailarh
Madhepura
Murliganj
N
W
E
S
Gwalpara
Bihariganj
MADHEPURA DISTRICT
Cyclone, 2015
Total House Damage
Index
0
25
29
120
141
427
1164
2130
Uda Kishunganj
Puraini
Alamnagar
Chausa
0
5 km

Criteria of selecting villages for community consultation

- Prone to Hazards
- Distance from hazard
- Concentration of socially disadvantage population

Hazards and Risks
Prioritised by Community

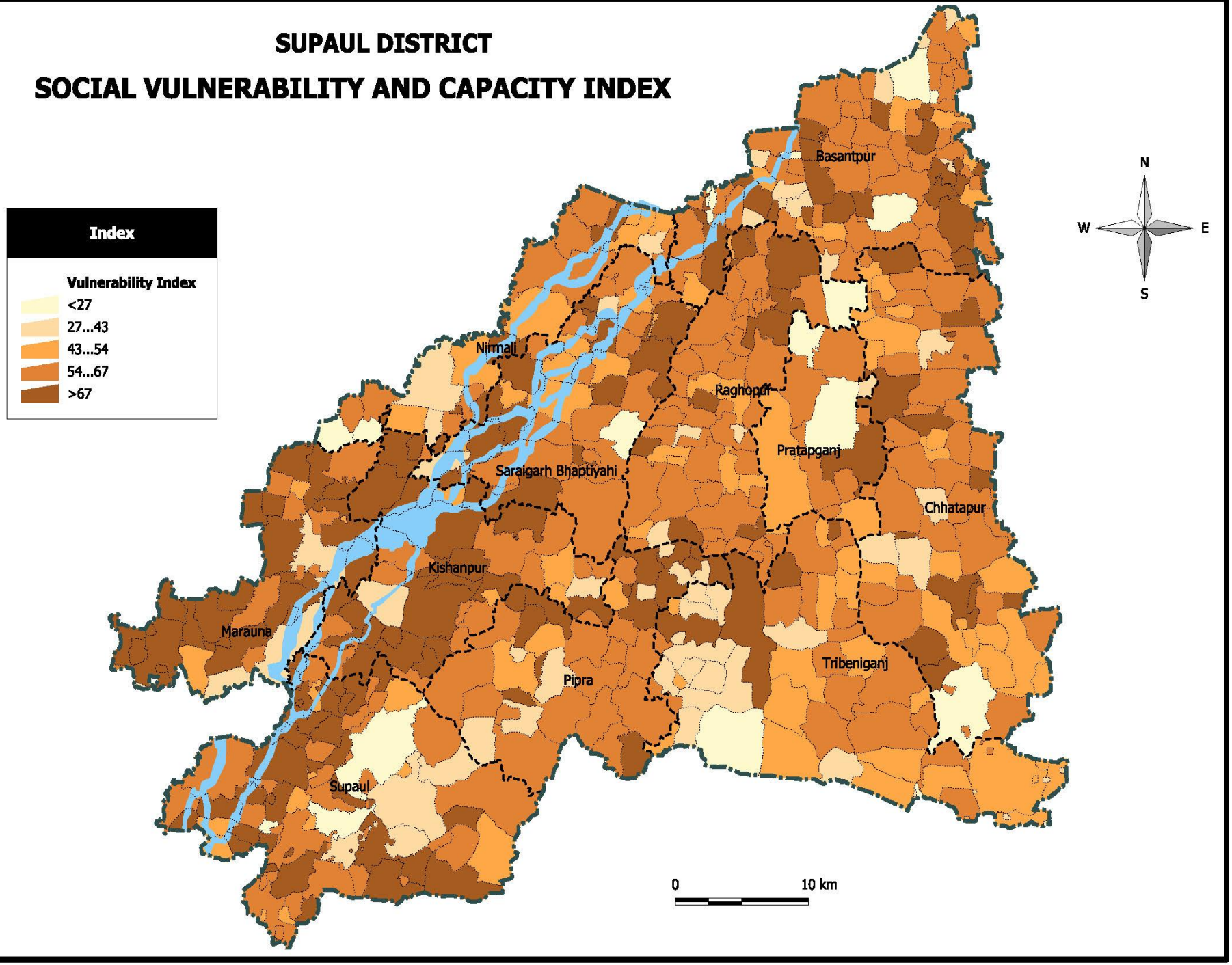


Vulnerability and Capacity assessment at community level (here village assumed as community)

- Physical vulnerability & Capacity (30)
  - Income,
  - Educational level,
  - Community assets
  - Distance from source of major hazard
- Institutional Vulnerability & Capacity (50)
  - Social network
  - Extra Kinship
  - Infrastructure : Road , electricity, mobile coverage, safe drinking water
  - Proportion of dependent population (Aged, child and women)
  - Warning system
  - Disadvantage Community
- Attitudinal Vulnerability & Capacity (20)
  - Self help ethos
  - knowledge about local hazards

SUPAUL DISTRICT

SOCIAL VULNERABILITY AND CAPACITY INDEX



District	Community 's recommendation
Supaul	• Promotion of Job opportunity through Jute, Bamboo industry at HHs level • Development of irrigation Facilities • Toilet • Safe drinking water during flood season • Road • Seed • Alternation livelihood options Climate resilient farming • De-silitation • Rehabilitation • Physical safety during
Bhojpur	• Construction of Embankment • Irrigation Facilities • Rehabilitation of Human and Animal • Ambulance facilities • Decentralization of power to Disaster management committee at village level • Not to involve local leaders in compensation distribution but to promote through PDS

Time line

Activities	Jan	Feb	March	April
Field testing of indicator of social vulnerability and capacity assessment at community level				
Vulnerability and capacity assessment at community level				
Sharing of HRVCA findings at district level				
Stakeholder consultation for understanding preventive and mitigation measures like building codes, flood plain management , storm water management, Urban resilience - planed and implemented by the local administration being adopted by the local authority				
Analytical review of programme and policies of core departments				
Capacity building and training need assessment of stakeholder and institution				
One to one consultation with department to comprehend the institutional mechanism and implementation of plan in different case scenario, contingency planning , and field coordination mechanism				
Designing of short and long term recovery plan through damage assessment mechanism				
Sharing of draft DDMP with BSDMA and District administration for feed back				
Incorporation of feedback and final submission of DDMP				

Thanks