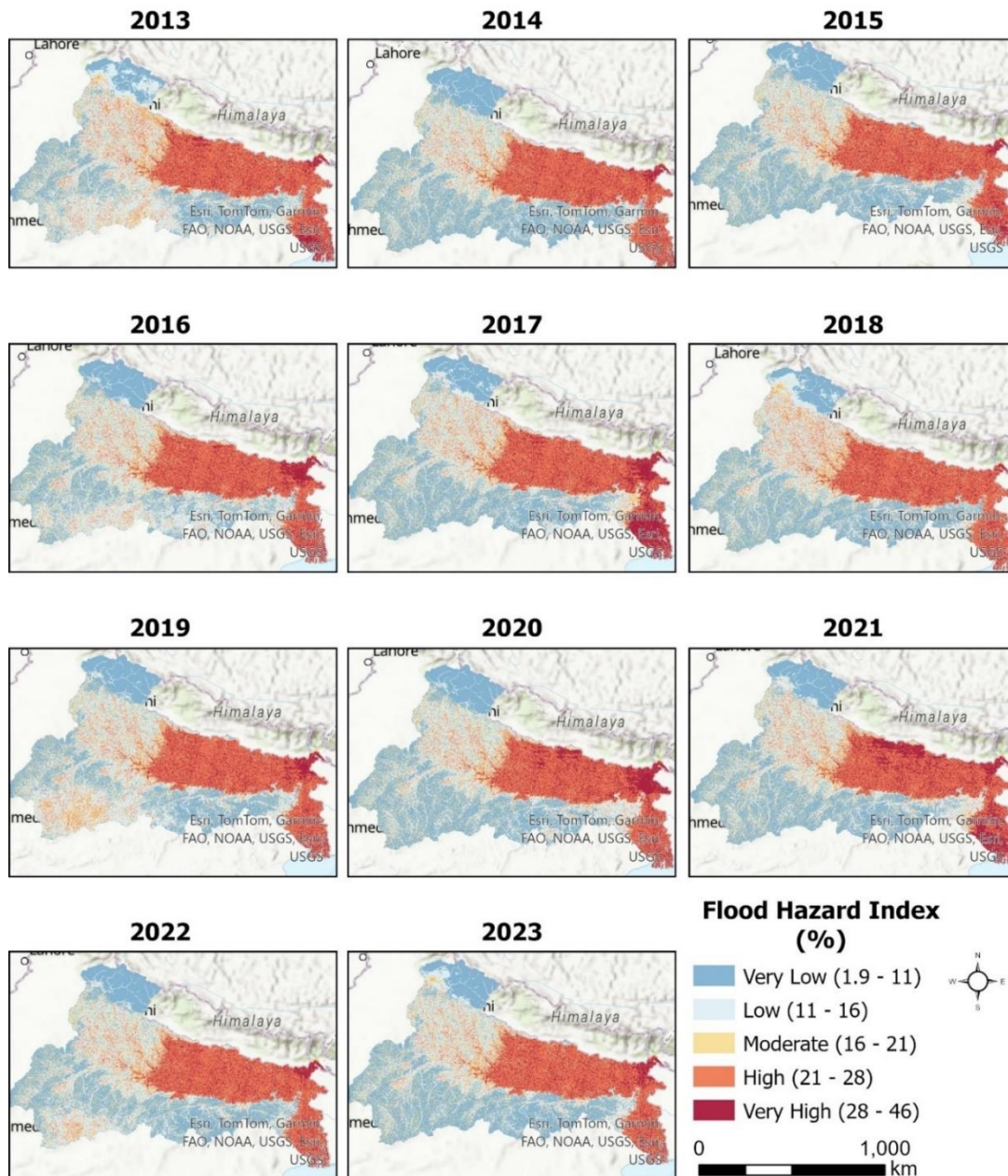
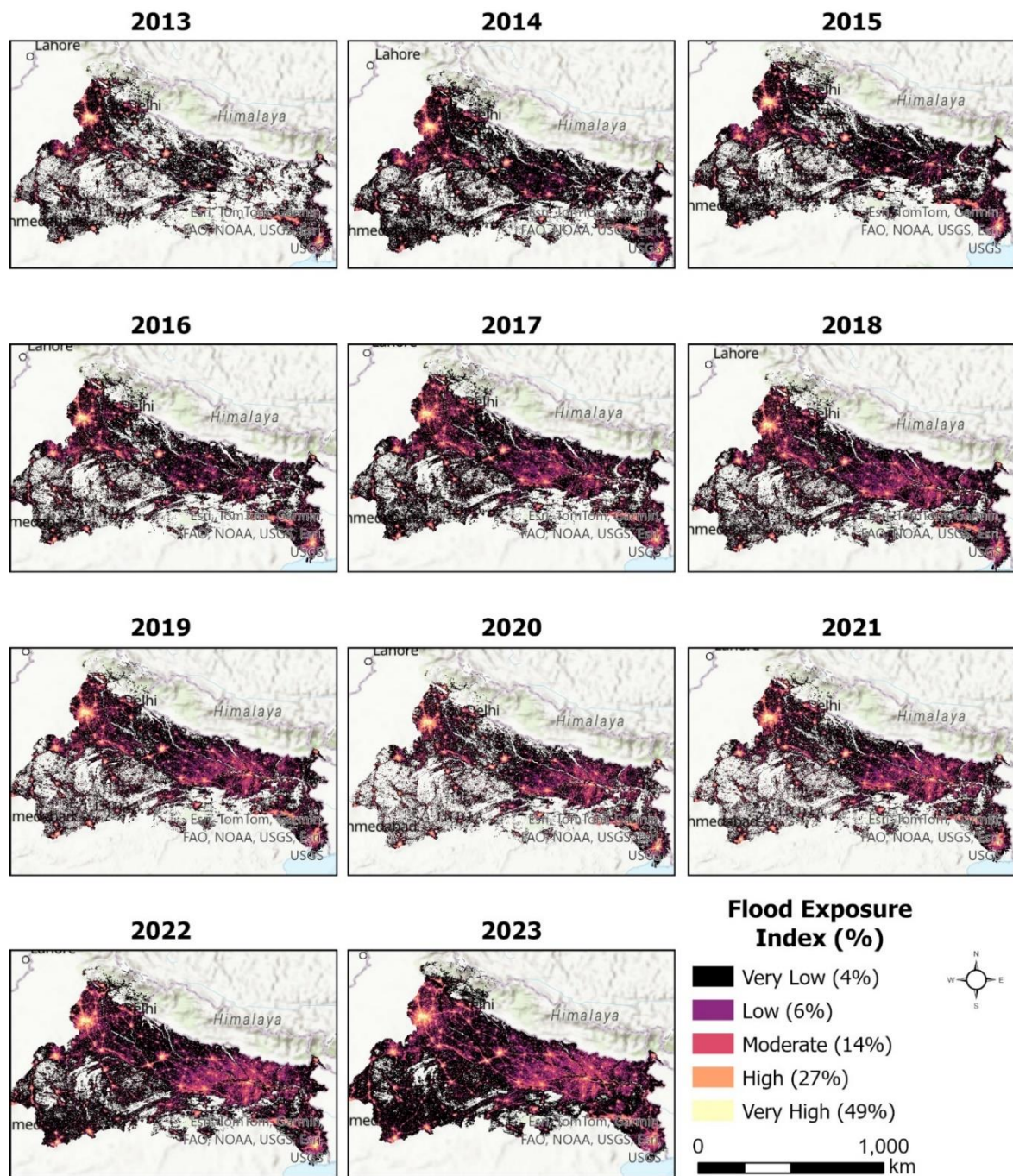


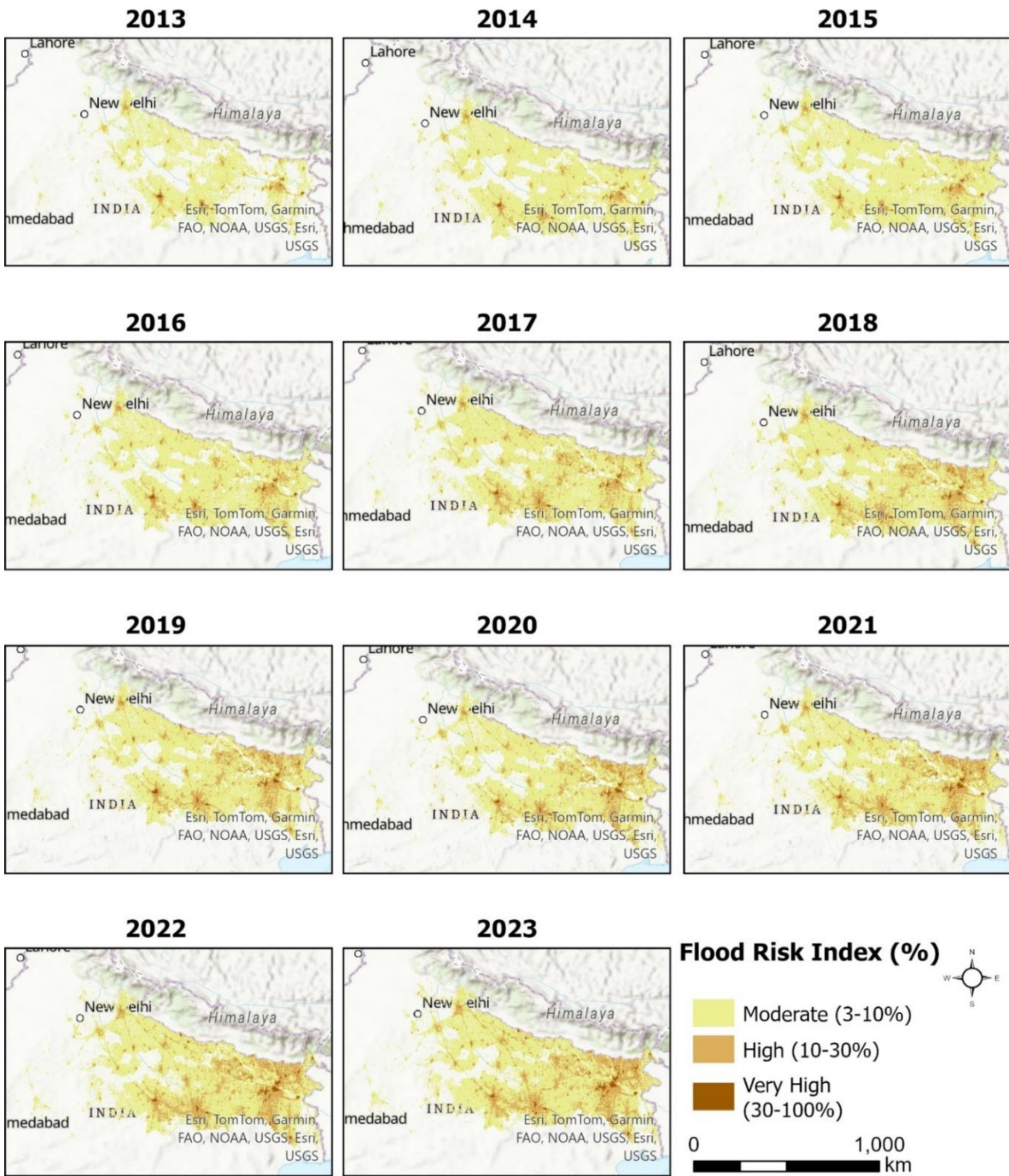
Supplementary



Supplementary Figure 1: Flood Hazard Index plots from 2013 to 2023. Basin produced after the AHP analysis. Continuous data ranging from 1.9 to ca. 46% classified into 5 categories of Very Low, Low, Moderate, High and Very High FHI. In the figure the blue areas have low FHI values, indicating less potential for flood occurrence or flood hazard, and red areas have higher flood hazard values, suggesting higher susceptibility to floods.



Supplementary Figure 2: FEI plots from 2013-2023 across the Ganga Basin produced after the AHP. The FEI is categorized into 5 classes based on the unique values of weights derived, which are: Very Low (4%), Low (6%), Moderate (14%), High (27%) and Very High (49%).



Supplementary Figure 3: Normalised flood risk index (FRI) map of the Ganga Basin. The FRI are shown in three categories- Yellow indicates moderate risk (3-10%), orange represents high risk (10-30%), and brown denotes very high risk (30-100%).

15 **Supplementary Table 1: Level 1 pairwise comparison for the flood hazard parameter**

		E	S	R	DR	DC	DD	FA	G	RW (Relative Weights)
Elevation	E	1	2	3	3	4	5	6	7	0.31
Slope	S	1/2	1	2	2	3	4	5	6	0.21
Rainfall	R	1/3	1/2	1	2	2	3	4	5	0.15
Distance to the river	DR	1/3	1/2	1/2	1	2	3	4	5	0.12
Distance from river confluence	DC	1/4	1/3	1/2	1/2	1	2	2	5	0.08
Drainage Density	DD	1/5	1/4	1/3	1/3	1/2	1	2	4	0.06
Flow Accumulation	FA	1/7	1/5	1/4	1/4	1/2	1/2	1	4	0.05
Geomorphology	G	1/8	1/6	1/5	1/5	1/5	1/4	1/4	1	0.02
$\lambda_{\max}$ = 8.334; C.I. = 0.047; RI = 1.41; CR = 0.033										

Supplementary Table 2: Level 2 hierarchy elevation

Elevation (in meters)							RW (Relative Weights)
		0-115	115-130	130-250	250-1,115	1,115-8,000	
0-115		1	3	5	6	7	0.49
115-130		1/3	1	3	5	6	0.27
130-250		1/5	1/3	1	3	4	0.14
250-1,115		1/6	1/5	1/3	1	2	0.06
1,115-8,000		1/7	1/6	1/4	1/2	1	0.04
$\lambda_{\max}$ = 5.228; C.I. = 0.057; RI = 1.12; CR = 0.051							

20 **Supplementary Table 3: Level 2 hierarchy slope**

Slope (in degrees)							
		0-1.5	1.5-1.7	1.7-3.2	3.2-13	13-90	RW (Relative Weights)
0-1.5		1	3	5	6	7	0.49
1.5-1.7		1/3	1	3	5	6	0.27
1.7-3.2		1/5	1/3	1	3	4	0.14
3.2-13		1/6	1/5	1/3	1	2	0.06
13-90		1/7	1/6	1/4	½	1	0.04
$\lambda_{\max}$ = 5.228; C.I. = 0.057; RI = 1.12; CR = 0.051							

Supplementary Table 4: Level 2 hierarchy for rainfall

Rainfall (in mm/month)							
		>350	290-350	260-290	200-260	0-200	RW (Relative Weights)
>350		1	3	5	6	7	0.49
290-350		1/3	1	3	5	6	0.27
260-290		1/5	1/3	1	3	4	0.14
200-260		1/6	1/5	1/3	1	2	0.06
0-200		1/7	1/6	1/4	1/2	1	0.04
$\lambda_{\max}$ = 5.228; C.I. = 0.057; RI = 1.12; CR = 0.051							

Supplementary Table 5: Level 2 hierarchy for distance to the river

Distance to the river (in meters)									
		0-500	500-1000	1000-1500	1500-2000	2000-2500	2500-3000	3000-3500	RW (Relative Weights)
0-500		1	3	4	5	5	6	8	0.37
500-1000		1/3	1	3	4	5	6	7	0.24
1000-1500		1/4	1/3	1	3	4	5	7	0.16
1500-2000		1/5	1/4	1/3	1	3	4	6	0.10
2000-2500		1/5	1/5	1/4	1/3	1	3	5	0.07
2500-3000		1/6	1/6	1/5	1/4	1/3	1	3	0.04
3000-3500		1/8	1/7	1/7	1/6	1/5	1/3	1	0.02
$\lambda_{\max}$ = 7.743; C.I. = 0.124; RI = 1.32; CR = 0.094									

25 **Supplementary Table 6: Level 2 hierarchy for the distance to the confluence points**

Distance to the confluence (in meters)							
		0-500	500-1000	1000-1500	1500-2000	2000-3000	RW (Relative Weights)
0-500		1	3	5	6	7	0.49
500-1000		1/3	1	3	5	6	0.27
1000-1500		1/5	1/3	1	3	4	0.14
1500-2000		1/6	1/5	1/3	1	2	0.06
2000-3000		1/7	1/6	1/4	1/2	1	0.04
$\lambda_{\max} = 5.228$; C.I. = 0.057; RI = 1.12; CR = 0.051							

Supplementary Table 7: Level 2 hierarchy for the drainage density

Drainage Density (in meter ⁻¹)							
		0.000089-0.000155	0.000052-0.000089	0.000032-0.000052	0.00002-0.000032	0-0.00002	RW (Relative Weights)
0.000089-0.000155		1	3	5	6	7	0.49
0.000052-0.000089		1/3	1	3	5	6	0.27
0.000032-0.000052		1/5	1/3	1	3	4	0.14
0.00002-0.000032		1/6	1/5	1/3	1	2	0.06
0-0.00002		1/7	1/6	1/4	1/2	1	0.04
$\lambda_{\max} = 5.228$; C.I. = 0.057; RI = 1.12; CR = 0.051							

Supplementary Table 8: Level 2 hierarchy for flow accumulation (unit cells)

Flow Accumulation							RW (Relative Weights)
		314-3800	26-324	2-26	1-2	0-1	
314-3800		1	3	5	6	7	0.49
26-314		1/3	1	3	5	6	0.27
2-26		1/5	1/3	1	3	4	0.14
1-2		1/6	1/5	1/3	1	2	0.06
0-1		1/7	1/6	1/4	1/2	1	0.04
$\lambda_{\max} = 5.228$; C.I. = 0.057; RI = 1.12; CR = 0.051							

35 Supplementary Table 9: Level 2 hierarchy for geomorphology

Geomorphology												RW (Relative Weights)
		AF	OF	AP	WB	C	AT	PP	P	HV	AOP	
Active floodplains	AF	1	3	4	5	5	6	6	7	8	8	0.29
older floodplains	OF	1/3	1	3	4	5	6	7	7	8	8	0.21
alluvial plains	AP	1/4	1/3	1	2	3	5	6	6	7	8	0.14
water bodies	WB	1/5	1/4	1/2	1	2	3	5	6	6	7	0.10
coastal	C	1/5	1/5	1/3	1/2	1	3	4	5	6	7	0.09
anthropogenic terrain	AT	1/6	1/6	1/5	1/3	1/3	1	3	5	6	7	0.07
pediment-peneplain	PP	1/6	1/7	1/6	1/5	1/4	1/3	1	2	3	5	0.04
plateau	P	1/7	1/7	1/6	1/6	1/5	1/5	1/2	1	2	3	0.03
hills and valleys	HV	1/8	1/8	1/7	1/6	1/6	1/6	1/3	1/2	1	3	0.02
aeolian plane	AOP	1/8	1/8	1/8	1/7	1/7	1/7	1/5	1/3	1/3	1	0.01
$\lambda_{\max} = 11.31$; C.I. = 0.146; RI = 1.49; CR = 0.098												

Supplementary Table 10: Level 1 Hierarchy of Exposure using night time lights.

Night-time Light Intensity							RW (Relative Weights)
		>=293	293-34	34-17	17-10	0-10	
>=293		1	3	5	6	7	0.49
34-293		1/3	1	3	5	6	0.27
17-34		1/5	1/3	1	3	4	0.14
10-17		1/6	1/5	1/3	1	2	0.06
0-10		1/7	1/6	1/4	1/2	1	0.04
$\lambda_{\max} = 5.228$; C.I. = 0.057; RI = 1.12; CR = 0.051							

40 Supplementary Table 11: Level 1 Hierarchy of Vulnerability Index from the Climate Vulnerability Report

Flood Vulnerability Index							RW (Relative Weights)
		0.65-0.73	0.575-0.65	0.5-0.575	0.425-0.5	0.35-0.425	
0.65-0.73		1	3	5	6	7	0.49
0.575-0.65		1/3	1	3	5	6	0.27
0.5-0.575		1/5	1/3	1	3	4	0.14
0.425-0.5		1/6	1/5	1/3	1	2	0.06
0.35-0.425		1/7	1/6	1/4	1/2	1	0.04
$\lambda_{\max} = 5.228$; C.I. = 0.057; RI = 1.12; CR = 0.051							