

**Table S1.** Quantification of the risk of soil erosion.

Micro watersheds	Br	Dd	Sf	Dt	Lof	Tsl	CCm	Ff	Cr	Er
2A2B5k	13	0.67	0.71	1.2	0.75	50.6	1.45	0.43	0.48	0.74
2A2B5b	15.5	0.38	0.76	0.86	1.31	16.6	1.64	1.07	0.37	1.17
2A2B5j	19.5	0.98	1.86	1.71	0.51	21.6	1.44	0.9	0.49	1.07
2A2B5h	22	0.39	0.53	0.55	1.28	17	1.79	1.25	0.31	1.26
2A2B5m	7	1.85	0.55	0.56	0.27	20.8	1.48	0.09	0.47	0.33

Br: bifurcation ratio, Dd: drainage density, Sf: stream frequency, Lof: length of overland flow, Tsl: total stream length, CCm: constant of channel maintenance, Ff: form factor, Cr: Circularity ratio, Er: elongation ratio

**Table S2.** Quantification of the Ground water Recharge risk

Micro watersheds	Lof	CC	Sf	CCm	Dd	Dt	Br	Ff	Er	Cr	Rn	Br	Rr
2A2B5k	0.75	1.5	0.71	1.5	0.67	1.2	13	0.43	0.74	0.48	0.22	336	25.32
2A2B5b	1.31	1.6	0.76	2.62	0.38	0.86	15.5	1.07	1.17	0.37	0.13	342	53.67
2A2B5j	0.51	1.4	1.86	1.02	0.98	1.71	19.5	0.9	1.07	0.49	0.34	345	69.83
2A2B5h	1.28	1.8	0.53	2.56	0.39	0.55	22	1.25	1.26	0.31	0.15	372	62.92
2A2B5m	0.27	1.5	0.55	0.54	1.85	0.56	7	0.09	0.33	0.47	0.57	309	17.43

Lof: length of overland flow, CC: compactness coefficient, Sf: stream frequency, CCm: constant of channel maintenance, Dd: drainage density, Dt: drainage texture, Br: bifurcation ratio, Ff: form factor, Cr: Circularity ratio, Er: elongation ratio, Rn: ruggedness number, Br: basin relief, Rr: relief ratio

**Table S3.** Quantification of the Hydro Geomorphological risk

Area in Km <sup>2</sup>												
Micro watersheds	I	Pt	Pn	Pb	Rh	MDh	Vf	W	P	R	HDh	
2A2B5k	0.042	22.49	11.38	0.056	0.294	37.29	2.492	0.081	-	-	-	
2A2B5b	-	7.73	29.29	0.52	-	1.35	3.3	0.42	-	-	-	
2A2B5j	-	6.2	11.91	0.14	0.5	0.53	2.1	0.14	0.19	0.4	-	
2A2B5h	-	10.5	20.69	0.42	0.07	0.05	3.39	0.26	0.399	0.95	0.054	
2A2B5m	0.42	46.92	73.43	1.15	0.87	69.94	11.4	0.91	0.86	3.35	3.06	

**Table S4.** Percentage of the total area of the Hydro Geomorphological risk

Area in percentage											
Micro watersheds	I	Pt	Pn	Pb	Rh	MDh	Vf	W	P	R	HDh
2A2B5k	9.1	23.97	7.76	2.45	17.02	34.16	10.99	4.5	-	-	-
2A2B5b	-	8.24	19.97	22.75	0	1.24	14.55	23.18	-	-	-
2A2B5j	-	6.61	8.12	6.12	28.9	0.49	9.26	7.73	13.11	8.51	0
2A2B5h	-	11.19	14.1	18.37	4.05	0.05	14.95	14.35	27.54	20.21	1.73
2A2B5m	90.9	50	50.05	50.31	50.29	64.07	50.26	50.23	59.35	71.28	98.27

I: inselberg, Pt: pediment, Pn: pediplain, Pb: point bar, Rh: residual hill, MDh: moderately dissected hills, Vf: valley fills, W: waterbody, P: pond, R: river, HDh: highly dissected hills

**Table S5.** Quantification of the Lithological risk

Area in square-km							
Micro watersheds	BG	GG	HS, A, MU	P	MS	CG, G	Gss
2A2B5k	7.75	64.14	3.82	0.13		-	
2A2B5b	-	31.21	0.13	-	12.12	-	
2A2B5j	-	19.59	0.13	0.13	2.13	0.09	
2A2B5h	-	30.07	0.5	-	3.61	7.24	2.24
2A2B5m	0.6	24.88	1.81	-	-	-	-

**Table S6.** Percentage of the total area of the Lithological risk.

Micro watersheds	BG	GG	HS, A, MU	P	MS	CG, G	Gss
2A2B5k	92.81	37.76	59.76	49.18	-	-	-
2A2B5b	-	18.37	2.03	-	67.86	-	-
2A2B5j	-	11.53	2.08	50.82	11.93	1.23	-
2A2B5h	-	17.7	7.82	-	20.21	98.77	100
2A2B5m	7.19	14.64	28.31	-	-	-	-

BG: biotite gneiss, GG: granite gneiss, HS: hornblende schist, A: amphibolite, Mu: meta ultrabasite, P: pegmatite, MS: mica schist, CG: calc gneiss, G: granulite, Gss: graphite silimate schist

**Table S7.** Quantification of the Land Use Land Cover risk.

Area in $Km^2$										
Micro watersheds	Ag	S	W	Lu	Sh	Pl	AgF	R	Df	Bl
2A2B5k	12.05	0.02	0.41	35.78	3.55	2.31	7.07	0.24	26.33	12.26
2A2B5b	39.88	2.68	0.07	4.04	8.28	12.04	14.6	0.65	2.91	0.23
2A2B5j	36.55	1.49	0.41	8.16	14.15	10.82	11.67	0.63	2.93	13.2
2A2B5h	31.84	1.15	0.53	7.93	16.4	15.02	11	0.78	10.15	5.19
2A2B5m	0	0.04	0.07	43.21	1.26	0.31	0.07	0.01	48.76	6.28

**Table S8.** percentage of the total area of the Land use Land Cover risk.

Area in percentage										
Micro watersheds	Ag	S	W	Lu	Sh	Pl	AgF	R	Df	Bl
2A2B5k	10.01	0.37	27.4	36.11	8.13	5.71	15.91	10.24	28.91	32.98
2A2B5b	33.14	49.82	4.52	4.07	18.98	29.73	32.87	27.96	3.19	0.62
2A2B5j	30.38	27.69	27.4	8.23	32.43	26.71	26.28	27.31	3.22	35.53
2A2B5h	26.47	21.39	35.7	8	37.59	37.1	24.77	33.81	11.15	13.97
2A2B5m	0	0.68	4.93	43.6	2.88	0.77	0.16	0.47	53.54	16.89

Ag: agricultural land, S: settlement, W: waterbody, Lu: lateritic upland, Sh: shrubs, Pl: plantation, AgF: agricultural fallow, R: river, Df: dense forest, Bl: barren land.

**Table S9.** Assessing the consistency ratio (CR) for the various thematic risk parameters.

Themes	Priority	Weighted Sum Ratio	$\lambda_{max}$	Consistency Index (CI)	Consistency ratio (CR)
Soil Erosion	0.29	1.4112	4.866207	0.0047	0.00422
Ground Water Recharge	0.22	1.097	4.986364		
LULC	0.22	1.097	4.986364		
Hydro Geomorphology	0.16	0.7813	4.883125		
Lithology	0.09	0.4665	5.183333		

**Table S10.** The Normalized Matrix

Micro watersheds (L <sub>m</sub> )	The Normalized values to the Criteria $r_{ij}$				
	Soil Erosion	Ground Water Re-charge	LULC	Hydro Geomorphology	Lithology
2A2B5k (L <sub>1</sub> )	0.057	0.060	0.048	0.052	0.073
2A2B5b (L <sub>2</sub> )	0.075	0.050	0.118	0.088	0.052
2A2B5j (L <sub>3</sub> )	0.057	0.083	0.083	0.050	0.052
2A2B5h (L <sub>4</sub> )	0.079	0.066	0.058	0.084	0.069
2A2B5m (L <sub>5</sub> )	0.066	0.065	0.075	0.089	0.078

**Table S11.** The weighted Normalized Matrix.

Alternatives (L <sub>m</sub> )	Weighted Normalized values of the criteria V <sub>ij</sub>				
	Soil Ero- sion	Ground Water Re- charge	LULC	Hydro Geomorphology	Lithology
2A2B5k (L <sub>1</sub> )	0.016	0.013	0.011	0.008	0.007
2A2B5b (L <sub>2</sub> )	0.022	0.011	0.026	0.014	0.005
2A2B5j (L <sub>3</sub> )	0.016	0.018	0.018	0.008	0.005
2A2B5h (L <sub>4</sub> )	0.023	0.015	0.013	0.013	0.006
2A2B5m (L <sub>5</sub> )	0.019	0.014	0.016	0.014	0.007