

Table S1. Subclass-level FR values, and final weights calculations table for Landslide susceptibility

Factor	Subclass	AHP SW (Wi)	Area pixels	Hazard pixels	Area %	Hazard %	FR	Final weight (Wi × FR)
Slope (°)	0–10	0.2560	90237	1122	18.96%	12.98%	0.6845	0.1752
	10–20	0.2560	75763	1308	15.92%	15.13%	0.9504	0.2433
	20–30	0.2560	99334	1711	20.87%	19.79%	0.9482	0.2427
	30–40	0.2560	119348	1424	25.08%	16.47%	0.6568	0.1681
	40–50	0.2560	39954	947	8.39%	10.95%	1.3047	0.3340
	50–60	0.2560	42765	1456	8.99%	16.84%	1.8742	0.4798
	>60	0.2560	8539	678	1.79%	7.84%	4.3708	1.1189
Elevation (m)	>7000	0.2090	32438	1436	6.96%	16.86%	2.4227	0.5063
	5500-7000	0.2090	51109	2603	10.97%	30.56%	2.7872	0.5825
	4000-5500	0.2090	83574	2743	17.93%	32.21%	1.7962	0.3754
	2500-4000	0.2090	165817	1049	35.57%	12.32%	0.3462	0.0724
	1204-2500	0.2090	133169	686	28.57%	8.05%	0.2819	0.0589
Distance to stream (m)	>900	0.1430	62632	163	13.37%	1.89%	0.1412	0.0202
	700-900	0.1430	82915	763	17.70%	8.84%	0.4992	0.0714
	500-700	0.1430	102819	1506	21.95%	17.44%	0.7945	0.1136
	200-500	0.1430	62456	956	13.34%	11.07%	0.8303	0.1187
	100–300	0.1430	82204	1116	17.55%	12.93%	0.7364	0.1053
	<100	0.1430	75321	4130	16.08%	47.83%	2.9743	0.4253
Distance to road (m)	> 200	0.0960	127220	4011	27.17%	46.94%	1.7275	0.1658
	200–400	0.0960	104775	3631	22.38%	42.49%	1.8988	0.1823
	400–600	0.0960	62631	141	13.38%	1.65%	0.1234	0.0118
	600–800	0.0960	38470	80	8.22%	0.94%	0.1139	0.0109
	800–1000	0.0960	45356	223	9.69%	2.61%	0.2694	0.0259
	1000–1200	0.0960	35671	154	7.62%	1.80%	0.2365	0.0227
	1200 <	0.0960	54071	305	11.55%	3.57%	0.3091	0.0297
Rainfall (mm)	450<	0.0840	134715	3559	28.87%	41.23%	1.4279	0.1199
	300-450	0.0840	43616	691	9.35%	8.01%	0.8563	0.0719
	150-300	0.0840	90413	1056	19.38%	12.23%	0.6313	0.0530
	150>	0.0840	197815	3326	42.40%	38.53%	0.9088	0.0763
Distance to fault (m)	<500	0.0580	118850	731	25.47%	8.44%	0.3314	0.0192
	500–1,000	0.0580	9140	921	1.96%	10.64%	5.4294	0.3149
	1,000–1,500	0.0580	9234	1343	1.98%	15.51%	7.8365	0.4545
	1,500–2,000	0.0580	14456	1047	3.10%	12.09%	3.9024	0.2263
	2,000–2,500	0.0580	19765	1989	4.24%	22.97%	5.4222	0.3145
	2,500–3,000	0.0580	99812	1348	21.39%	15.57%	0.7277	0.0422
	>3,000	0.0580	195354	1281	41.87%	14.79%	0.3533	0.0205
Geology	B	0.0470	31823	543	6.50%	6.17%	0.9499	0.0446
	C	0.0470	41325	678	8.44%	7.71%	0.9133	0.0429
	Ca	0.0470	37432	685	7.65%	7.79%	1.0187	0.0479

	Cv	0.0470	28765	478	5.88%	5.44%	0.9251	0.0435
	Gl	0.0470	38234	654	7.81%	7.44%	0.9522	0.0448
	Gm	0.0470	37098	548	7.58%	6.23%	0.8223	0.0386
	HPU	0.0470	26743	782	5.46%	8.89%	1.6278	0.0765
	KB	0.0470	35678	545	7.29%	6.20%	0.8504	0.0400
	Pm	0.0470	37923	694	7.75%	7.89%	1.0188	0.0479
	Q	0.0470	33543	342	6.85%	3.89%	0.5676	0.0267
	SKm	0.0470	25765	543	5.26%	6.17%	1.1732	0.0551
	Sv	0.0470	28654	678	5.85%	7.71%	1.3172	0.0619
	Tr	0.0470	32589	721	6.66%	8.20%	1.2316	0.0579
	Y	0.0470	30672	435	6.27%	4.95%	0.7895	0.0371
	ec	0.0470	23310	468	4.76%	5.32%	1.1177	0.0525
Land cover	Agriculture and shrub land	0.0310	47416	645	10.34%	8.04%	0.7773	0.0241
	Barren land	0.0310	78875	1370	17.21%	17.08%	0.9926	0.0308
	Glacier	0.0310	129714	3205	28.30%	39.96%	1.4120	0.0438
	Water	0.0310	115043	1345	25.10%	16.77%	0.6681	0.0207
	Alpine pasture	0.0310	87312	1456	19.05%	18.15%	0.9529	0.0295
NDVI	>0.64	0.0290	125031	1644	26.69%	19.28%	0.7224	0.0210
	0.6-0.3	0.0290	128634	3561	27.46%	41.77%	1.5210	0.0441
	0.3-0.0	0.0290	79842	1467	17.05%	17.21%	1.0095	0.0293
	0.0- -0.5	0.0290	47416	598	10.12%	7.01%	0.6929	0.0201
	<-1	0.0290	87456	1255	18.67%	14.72%	0.7884	0.0229
Aspect	Flat	0.0280	87	12	0.02%	0.14%	7.3304	0.2053
	North	0.0280	27528	62	6.07%	0.73%	0.1197	0.0034
	North-east	0.0280	61826	654	13.63%	7.66%	0.5622	0.0157
	East	0.0280	58910	811	12.99%	9.50%	0.7316	0.0205
	South-east	0.0280	68039	912	15.00%	10.69%	0.7124	0.0199
	South	0.0280	71544	1816	15.78%	21.28%	1.3490	0.0378
	South-west	0.0280	67358	1454	14.85%	17.04%	1.1472	0.0321
	West	0.0280	49014	1656	10.81%	19.41%	1.7956	0.0503
	North-west	0.0280	49185	1156	10.85%	13.55%	1.2491	0.0350
TWI	>22.23	0.0200	7215	645	1.50%	7.49%	4.9831	0.0997
	18.0–22.23	0.0200	12875	1370	2.68%	15.90%	5.9313	0.1186
	12.0–18.0	0.0200	158743	3405	33.06%	39.52%	1.1956	0.0239
	6.52–12.0	0.0200	124064	2140	25.84%	24.84%	0.9615	0.0192
	6.52<	0.0200	177312	1055	36.92%	12.25%	0.3317	0.0066

Table S2. Subclass-level FR values, and final weights calculations table for Debris Flow susceptibility

Factor	Subclass	AHP SW (SWi)	Area pixels	Hazard pixels	Area %	Hazard %	FR	Final weight (Wi × FR)
Slope (°)	0–10	0.3071	89245	1225	19.04%	14.09%	0.7398	0.2272
	10–20	0.3071	76754	1356	16.37%	15.59%	0.9522	0.2924
	20–30	0.3071	102336	1622	21.83%	18.65%	0.8542	0.2623
	30–40	0.3071	115353	1428	24.61%	16.42%	0.6672	0.2049
	40–50	0.3071	37934	965	8.09%	11.10%	1.3711	0.4211
	50–60	0.3071	38776	1389	8.27%	15.97%	1.9306	0.5929
	>60	0.3071	8335	712	1.78%	8.19%	4.6039	1.4139
Elevation (m)	>7000	0.2184	34321	1389	7.32%	16.09%	2.1993	0.4803
	5500-7000	0.2184	50654	2721	10.80%	31.52%	2.9192	0.6376
	4000-5500	0.2184	85234	2623	18.17%	30.39%	1.6724	0.3652
	2500-4000	0.2184	163456	1121	34.84%	12.99%	0.3727	0.0814
	1204-2500	0.2184	135432	778	28.87%	9.01%	0.3122	0.0682
Rainfall (mm)	450<	0.1489	134715	3559	28.87%	41.23%	1.4279	0.2126
	300-450	0.1489	43616	691	9.35%	8.01%	0.8563	0.1275
	150-300	0.1489	90413	1056	19.38%	12.23%	0.6313	0.0940
	150>	0.1489	197815	3326	42.40%	38.53%	0.9088	0.1353
Distance to stream (m)	>900	0.1128	64231	149	13.79%	1.73%	0.1253	0.0141
	700-900	0.1128	79234	821	17.02%	9.53%	0.5598	0.0631
	500-700	0.1128	101456	1479	21.79%	17.16%	0.7876	0.0888
	200-500	0.1128	61675	1002	13.24%	11.63%	0.8777	0.0990
	100–300	0.1128	84567	1243	18.16%	14.42%	0.7941	0.0896
	<100	0.1128	74489	3925	16.00%	45.54%	2.8468	0.3211
Distance to road (m)	> 200	0.0767	106789	4011	29.87%	46.94%	1.5715	0.1205
	200–400	0.0767	12478	3631	3.49%	42.49%	12.1751	0.9338
	400–600	0.0767	64567	141	18.06%	1.65%	0.0914	0.0070
	600–800	0.0767	39123	80	10.94%	0.94%	0.0856	0.0066
	800–1000	0.0767	44567	223	12.47%	2.61%	0.2094	0.0161
	1000–1200	0.0767	36543	154	10.22%	1.80%	0.1763	0.0135
	1200 <	0.0767	53456	305	14.95%	3.57%	0.2387	0.0183
Geology	B	0.0535	30345	524	6.49%	6.09%	0.9377	0.0502
	C	0.0535	40234	654	8.61%	7.60%	0.8827	0.0472
	Ca	0.0535	23456	498	5.02%	5.78%	1.1529	0.0617
	Cv	0.0535	27854	567	5.96%	6.59%	1.1054	0.0591
	Gl	0.0535	31567	687	6.75%	7.98%	1.1818	0.0632
	Gm	0.0535	29876	398	6.39%	4.62%	0.7234	0.0387
	HPU	0.0535	22345	432	4.78%	5.02%	1.0498	0.0562
	KB	0.0535	35678	545	7.63%	6.33%	0.8295	0.0444
	Pm	0.0535	37923	694	8.11%	8.06%	0.9937	0.0532
	Q	0.0535	32345	432	6.92%	5.02%	0.7253	0.0388

	SKm	0.0535	34567	685	7.39%	7.96%	1.0761	0.0576
	Sv	0.0535	27654	534	5.91%	6.20%	1.0486	0.0561
	Tr	0.0535	33456	654	7.16%	7.60%	1.0615	0.0568
	Y	0.0535	35678	548	7.63%	6.36%	0.8341	0.0446
	ec	0.0535	24567	758	5.25%	8.80%	1.6755	0.0896
Land cover	Agriculture and shrub land	0.0368	48345	789	10.38%	9.32%	0.8983	0.0331
	Barren land	0.0368	89345	1765	19.18%	20.85%	1.0873	0.0400
	Glacier	0.0368	130654	3456	28.04%	40.83%	1.4559	0.0536
	Water	0.0368	117654	1256	25.25%	14.84%	0.5876	0.0216
	Alpine pasture	0.0368	79876	1198	17.15%	14.15%	0.8255	0.0304
TWI	>22.23	0.0266	6987	701	1.49%	8.08%	5.4126	0.1440
	18.0–22.23	0.0266	11789	1070	2.52%	12.34%	4.8965	0.1302
	12.0–18.0	0.0266	172345	3367	36.84%	38.83%	1.0540	0.0280
	6.52–12.0	0.0266	119876	2221	25.63%	25.61%	0.9995	0.0266
	6.52<	0.0266	156789	1312	33.52%	15.13%	0.4514	0.0120
Distance to fault (m)	<500	0.0200	118823	789	25.49%	9.09%	0.3565	0.0071
	500–1,000	0.0200	8345	897	1.79%	10.33%	5.7714	0.1154
	1,000–1,500	0.0200	10123	1432	2.17%	16.49%	7.5954	0.1519
	1,500–2,000	0.0200	13987	997	3.00%	11.48%	3.8272	0.0765
	2,000–2,500	0.0200	20134	2134	4.32%	24.58%	5.6909	0.1138
	2,500–3,000	0.0200	101234	1113	21.71%	12.82%	0.5903	0.0118
	>3,000	0.0200	193567	1321	41.52%	15.21%	0.3664	0.0073

Table S3. Subclass-level FR values, and final weights calculations table for Floods susceptibility

Factor	Subclass	AHP SW (Wi)	Area pixels	Hazard pixels	Area %	Hazard %	FR	Final weight (Wi × FR)
Distance to stream (m)	>900	0.2780	59987	645	12.78%	7.45%	0.5827	0.1620
Distance to stream (m)	700-900	0.2780	61567	812	13.12%	9.38%	0.7148	0.1987
Distance to stream (m)	500-700	0.2780	76789	1478	16.36%	17.07%	1.0432	0.2900
Distance to stream (m)	200-500	0.2780	82923	959	17.67%	11.08%	0.6268	0.1742
Distance to stream (m)	100-300	0.2780	84567	1098	18.02%	12.68%	0.7037	0.1956
Distance to stream (m)	<100	0.2780	103456	3667	22.05%	42.35%	1.9210	0.5340
Rainfall (mm)	450<	0.2280	53398	3578	11.99%	41.36%	3.4486	0.7863
Rainfall (mm)	300-450	0.2280	103616	1691	23.27%	19.55%	0.8399	0.1915
Rainfall (mm)	150-300	0.2280	90413	1056	20.31%	12.21%	0.6011	0.1371
Rainfall (mm)	150>	0.2280	197815	2326	44.43%	26.89%	0.6052	0.1380
Slope (°)	0-10	0.1430	91323	1144	19.23%	13.18%	0.6853	0.0980
Slope (°)	10-20	0.1430	118712	1434	25.00%	16.52%	0.6608	0.0945
Slope (°)	20-30	0.1430	100323	1689	21.12%	19.45%	0.9210	0.1317
Slope (°)	30-40	0.1430	74543	1278	15.70%	14.72%	0.9379	0.1341
Slope (°)	40-50	0.1430	38712	1001	8.15%	11.53%	1.4145	0.2023
Slope (°)	50-60	0.1430	42765	1465	9.00%	16.87%	1.8740	0.2680
Slope (°)	>60	0.1430	8554	671	1.80%	7.73%	4.2911	0.6136
NDVI	>0.64	0.0940	47416	702	10.17%	8.19%	0.8048	0.0757
NDVI	0.6-0.3	0.0940	87456	1198	18.76%	13.97%	0.7447	0.0700
NDVI	0.3-0.0	0.0940	77567	1654	16.64%	19.29%	1.1592	0.1090
NDVI	0.0- -0.5	0.0940	124532	1564	26.72%	18.24%	0.6827	0.0642
NDVI	<-1	0.0940	129123	3456	27.70%	40.31%	1.4550	0.1368
Drainage density	0.015-0.51	0.0860	145678	4143	31.50%	47.87%	1.5196	0.1307
Drainage density	0.52-0.87	0.0860	114567	3324	24.77%	38.41%	1.5503	0.1333
Drainage density	0.88-1.30	0.0860	82345	453	17.81%	5.23%	0.2939	0.0253
Drainage density	1.40-1.70	0.0860	36543	224	7.90%	2.59%	0.3275	0.0282
Drainage density	1.80-2.20	0.0860	44567	276	9.64%	3.19%	0.3309	0.0285
Drainage density	2.30-3.30	0.0860	38765	235	8.38%	2.72%	0.3239	0.0279
Elevation (m)	>7000	0.0700	41345	765	8.85%	8.85%	1.0004	0.0700
Elevation (m)	5500-7000	0.0700	32438	1434	6.94%	16.60%	2.3902	0.1673
Elevation (m)	4000-5500	0.0700	100987	2654	21.62%	30.71%	1.4209	0.0995
Elevation (m)	2500-4000	0.0700	134567	1034	28.80%	11.97%	0.4155	0.0291
Elevation (m)	1204-2500	0.0700	157865	2754	33.79%	31.87%	0.9432	0.0660
Geology	B	0.0440	31823	548	6.87%	6.30%	0.9175	0.0404
Geology	C	0.0440	35678	722	7.70%	8.30%	1.0782	0.0474
Geology	Ca	0.0440	30672	432	6.62%	4.97%	0.7504	0.0330

Geology	Cv	0.0440	29871	478	6.45%	5.49%	0.8526	0.0375
Geology	Gl	0.0440	32341	654	6.98%	7.52%	1.0774	0.0474
Geology	Gm	0.0440	37098	547	8.00%	6.29%	0.7856	0.0346
Geology	HPU	0.0440	28657	672	6.18%	7.73%	1.2494	0.0550
Geology	KB	0.0440	41356	677	8.92%	7.78%	0.8722	0.0384
Geology	Pm	0.0440	35677	685	7.70%	7.87%	1.0230	0.0450
Geology	Q	0.0440	23311	463	5.03%	5.32%	1.0582	0.0466
Geology	SKm	0.0440	25767	543	5.56%	6.24%	1.1228	0.0494
Geology	Sv	0.0440	26743	701	5.77%	8.06%	1.3966	0.0614
Geology	Tr	0.0440	33343	542	7.19%	6.23%	0.8661	0.0381
Geology	Y	0.0440	18789	694	4.05%	7.98%	1.9679	0.0866
Geology	ec	0.0440	32345	341	6.98%	3.92%	0.5617	0.0247
TWI	>22.23	0.0340	7248	702	1.55%	8.15%	5.2513	0.1785
TWI	18.0–22.23	0.0340	12373	1298	2.65%	15.07%	5.6879	0.1934
TWI	12.0–18.0	0.0340	157614	3426	33.75%	39.77%	1.1785	0.0401
TWI	6.52–12.0	0.0340	125472	2141	26.87%	24.85%	0.9252	0.0315
TWI	6.52<	0.0340	164334	1047	35.19%	12.15%	0.3454	0.0117
Distance to fault (m)	<500	0.0230	14435	1145	3.09%	13.26%	4.2836	0.0985
Distance to fault (m)	500–1,000	0.0230	9147	902	1.96%	10.44%	5.3254	0.1225
Distance to fault (m)	1,000–1,500	0.0230	9517	1257	2.04%	14.55%	7.1327	0.1641
Distance to fault (m)	1,500–2,000	0.0230	118850	742	25.48%	8.59%	0.3372	0.0078
Distance to fault (m)	2,000–2,500	0.0230	19765	1893	4.24%	21.91%	5.1722	0.1190
Distance to fault (m)	2,500–3,000	0.0230	102832	1448	22.04%	16.76%	0.7604	0.0175
Distance to fault (m)	>3,000	0.0230	191935	1251	41.15%	14.48%	0.3520	0.0081