

Table 1 Sources of data for extracting thematic maps

Base data	Source	Resolution/scale	Data type
Digital elevation model	Aster global DEM	Spatial resolution (30 m)	Grid
Slope, Aspect, Altitude, TWI, plan and profile curvature	DEM		Grid
NDVI	Landsat8 (OLI) https://www.usgs.gov/	30 * 30 m	Grid
Stream and road line	Topographic map	1:100,000	Vector
Lithology	Geological Survey of Iran	1:250,000	Vector
Fault line	Geological Survey of Iran	1:500,000	Vector
Land use map	National Geographic Organization		Vector
Rainfall map	Forest Range and Watershed Management Organization		Datasheet

Table 2 Consistency index for BWM model

α_{BW}	1	2	3	4	5	6	7	8	9
Consistency index (max ξ)	0.00	0.44	1.00	1.63	2.30	3.00	3.73	4.47	5.23

Table 3 Correlation between conditioning factors and landslides using SWARA and BWM methods

factors	Classes	No. of pixels	No. of landslide	SWARA weight	BWM weight
Slope ($^{\circ}$)	0-5	1399694	9	0.072	0.081
	5-15	4446507	91	0.405	0.409

	15-25	2912563	49	0.222	0.245
	25-35	1446722	19	0.135	0.122
	35-45	449938	4	0.094	0.098
	45 <	54692	0	0.072	0.04
Aspect	Flat	9153	0	0.010	0.021
	North	1176972	23	0.240	0.150
	Northeast	1207841	27	0.486	0.249
	East	1455349	24	0.043	0.100
	Southeast	1448072	18	0.030	0.075
	South	1374977	16	0.010	0.075
	Southwest	1341662	25	0.130	0.150
	West	1414314	17	0.020	0.075
	Northwest	1281776	22	0.075	0.100
Altitude (m)	< 300	4810	0	0.011	0.022
	300-500	268767	2	0.012	0.048
	500-700	424112	7	0.043	0.081
	700-900	386144	1	0.010	0.040
	900-1100	577848	6	0.018	0.061
	1100-1300	1097227	18	0.026	0.081
	1300-1500	1295792	25	0.070	0.122
	1500-1700	1373049	35	0.434	0.212
	1700-1900	1646086	36	0.124	0.122
	1900-2100	1417738	32	0.230	0.122
	2100-2300	1088180	7	0.011	0.048
	2300<	1130363	3	0.010	0.034
TWI	2.05-5.65	3768829	60	0.135	0.223
	5.65-7.31	4497970	74	0.249	0.371
	7.31-9.87	1906000	32	0.482	0.371
	9.87-19.77	537317	6	0.135	0.033
Plan curvature	Concave	4826967	68	0.295	0.153
	Flat	904609	10	0.295	0.077
	Convex	4978540	94	0.410	0.769
Profile curvature	Convex	4901545	79	0.256	0.470
	Flat	659610	8	0.256	0.058
	Concave	5148961	85	0.489	0.470
Distance to roads(m)	0-100	103001	8	0.311	0.397
	100-200	108350	2	0.079	0.060
	200-300	95468	1	0.074	0.053
	300-400	97304	5	0.115	0.160
	400-500	94113	1	0.074	0.034
	500-600	94909	3	0.088	0.080

Table 3 (continued)

factor	Classes	No. of pixels	No. of landslide	SWARA weight	BWM weight
	600-700	89726	5	0.186	0.160
	700<	10027245	147	0.074	0.053
Distance to the streams (m)	0-100	598759	15	0.404	0.297
	100-200	621360	4	0.050	0.053
	200-300	541972	13	0.207	0.297
	300-400	548775	5	0.056	0.061
	400-500	525724	11	0.115	0.123
	500-600	519333	2	0.049	0.027
	600-700	475616	2	0.052	0.046

	700 <	6878577	120	0.070	0.092
Distance to the fault (m)	0-300	811508	17	0.137	0.141
	300-600	719258	11	0.035	0.060
	600-900	637045	13	0.086	0.084
	900-1200	589164	11	0.040	0.105
	1200-1500	550253	14	0.386	0.330
	1500-1800	519672	10	0.058	0.105
	1800-2100	497244	11	0.223	0.141
Lithology	2100 <	6385972	85	0.035	0.029
	Eav	3750540	63	0.024	0.033
	Ek	617425	1	0.013	0.026
	Jl	39859	4	0.344	0.200
	Jshl.s	158549	0	0.013	0.018
	K1-2lm	36543	3	0.098	0.117
	Kn1	62224	1	0.021	0.033
	Md.av	697930	5	0.014	0.029
	Mm,s,l	689808	9	0.016	0.031
	Od.av	346860	14	0.070	0.039
	Olm,s,c	269095	1	0.013	0.026
	PAgr-di	68179	2	0.039	0.042
	Plms	991794	19	0.033	0.029
	PIQc	193027	18	0.179	0.200
	Pz1mt	504034	8	0.018	0.033
	Qft1	225295	2	0.015	0.029
	Qft2	280576	5	0.028	0.033
	TRJs	444708	17	0.051	0.046
	Other	1333670	0	0.013	0.023
	Land use	Agriculture	158846	8	0.270
Agri-Orchard		405731	9	0.187	0.113
Dry Farming		1130660	9	0.097	0.085
Range		8762759	144	0.141	0.097
Forest		150480	2	0.112	0.085
Urban		6222	0	0.057	0.075
Woodland		95418	0	0.057	0.036

Table 3 (continued)

factor	Classes	No. of Pixels	No. of landslide	SWARA weight	BWM weight
Rainfall (mm)	250 - 303.6	6540472	80	0.215	0.098
	303.6 - 332.9	2380022	28	0.215	0.056
	332.9 - 387.65	1359433	52	0.352	0.647
	387.65 - 500	430189	12	0.219	0.197
NDVI	< -0.14	2512	0	0.107	0.05
	(-0.14) – (0.16)	4170747	65	0.163	0.138
	0.16 - 0.27	4966863	81	0.239	0.138
	0.27 - 0.5	1209116	14	0.121	0.098

0.5 >	360878	12	0.356	0.574
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Table 4 AUC and MSE values of two ensemble models for testing.

Models	Percentage of LSMs classes					Validation		
	Very low	Low	Moderate	High	Very high	MSE	RMSE	AUC
ANFIS-BWM	20.49	20.50	20.16	20.17	18.65	0.242	0.433	75%
ANFIS-SWARA	19.89	18.49	22.41	23.01	16.21	0.299	0.477	73.6%

Table 5 Models performances using quantitative indices

Testing dataset	Models	
	ANFIS-BWM	ANFIS-SWARA
True positive (TP)	61	60
True negative (TN)	38	36
False positive (FP)	32	34
False negative (FN)	9	10
positive predictive value (PPV)	65.6	63.8
negative predictive value (NPV)	80.9	78.3
Sensitivity (%)	87.1	85.7
Specificity (%)	54.3	51.4
Accuracy (%)	70.7	68.6