

Table 2) the indicators influencing wind-catchers location in the arid climate

Indicators	Explanation (qualitative)	Optimum range(quantitative)
Sunny hours	As the wind-catchers are used in warm seasons, sunny hours were considered for six months of spring and summer. Those regions with fewer sunny hours were selected because longer sunny hours reduce wind-catchers' efficiency.	3000-3300 hours a year
Wind	Wind speed, direction, and the number of windy days are of importance in designing wind-catchers. Those regions with the most winds and the least dust are the most proper ones because bringing dust into the buildings is one of the problems of wind-catchers.	1.5 m/sec in average
Relative humidity	The higher relative humidity is more desirable because of the air dryness in arid regions.	At least 30%
Altitude	The higher altitudes are better for wind-catchers establishment because of the faster and more intense winds.	500-2500m above the sea level
Precipitation	Those regions with more annual precipitation are more humid. However, it shows more cloudy days which is not good. Higher precipitation makes better vegetation that reduces air dust.	100-200 mm a year
Temperature	Cooler air around the wind-catchers improves their efficiency and ventilates the buildings much better. Hence, lower regions with lower temperatures are better for wind-catchers establishment.	14-20°C in average

Table 3) meteorological and climatic data in Semnan province in a 20-year period (1999-2019)

Station	Sunny hours	Wind (m/sec)	Relative humidity (%)	Altitude (m)	Precipitation (mm)	Temperature (C)
Semnan	3215	2	37	600-2400	141.8	18.7
Shahrood	3214	2.6	50	600-3500	154.1	15.6
Garmsar	3269	3.9	39	800-2000	110.9	20
Damghan	3176	3.6	42	700-3400	103.2	17.5
Mahdishahr	2980	3.3	44	1500-3300	250	13
Aradan	3267	3.7	38	200-2100	108	20
Miami	3188	2.6	47	600-1900	130.9	16.1
Sorkheh	3210	2.3	35	600-2500	130.4	18.9

Table 4) pairwise comparison of the indicators

	Wind	Temperature	Relative humidity	Altitude	Precipitation	Sunny hours
Wind	1	1.4	7	1.3	1.5	1.4
Temperature	4.1	1	1.3	2	1.2	1.2
Relative humidity	1.7	3.1	1	8	6	7
Altitude	3.1	1.2	1.8	1	1.2	1.2
Precipitation	5.1	2.1	1.6	2.1	1	2
Sunny hours	4.1	2.1	1.7	2.1	1.2	1

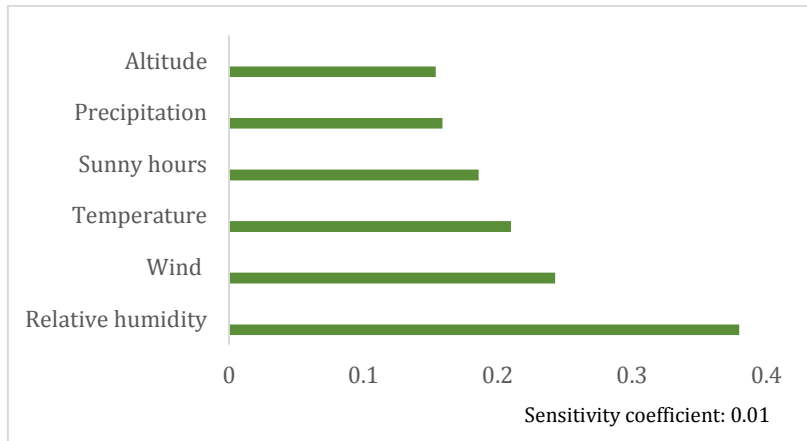


Figure 3) relative weight of the indicators

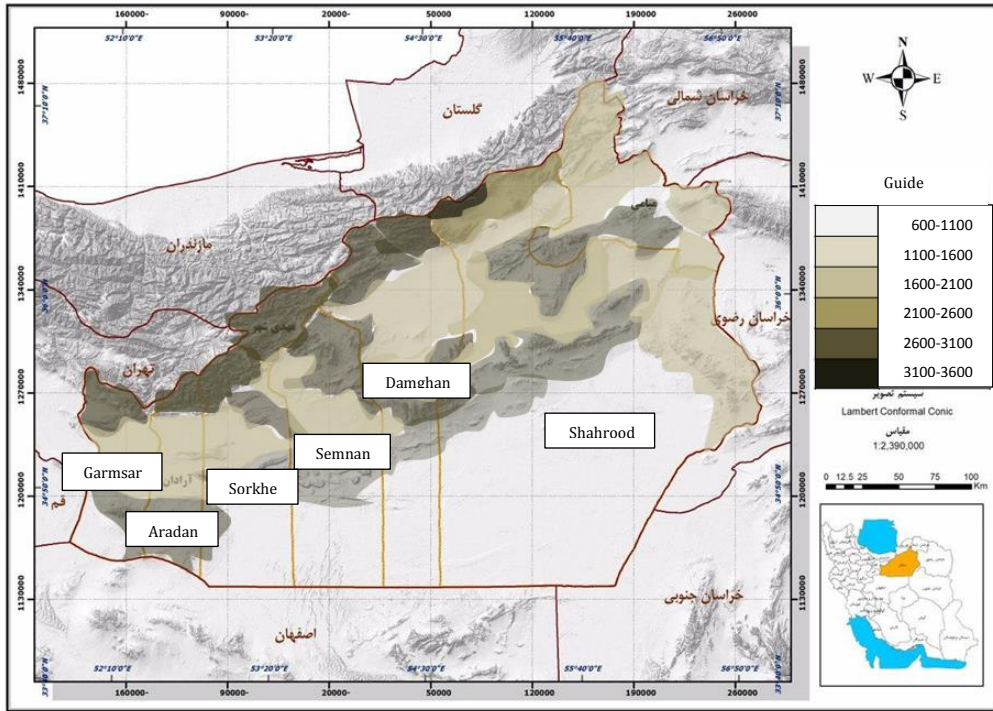


Figure 4) altitude map in the studied area

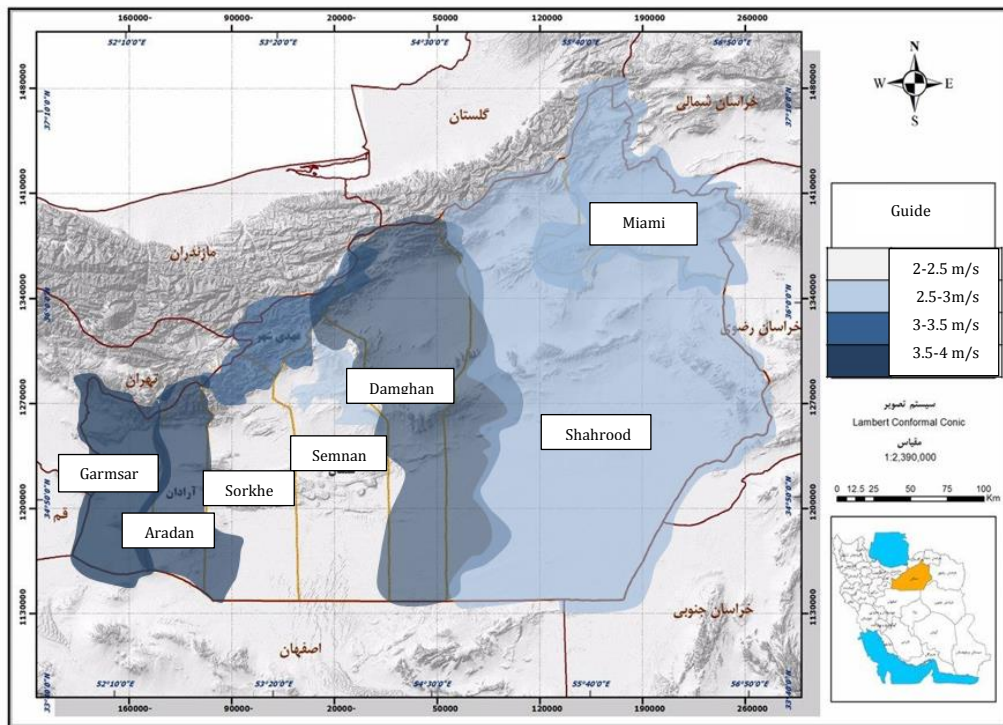


Figure 5) wind zones in the studied area

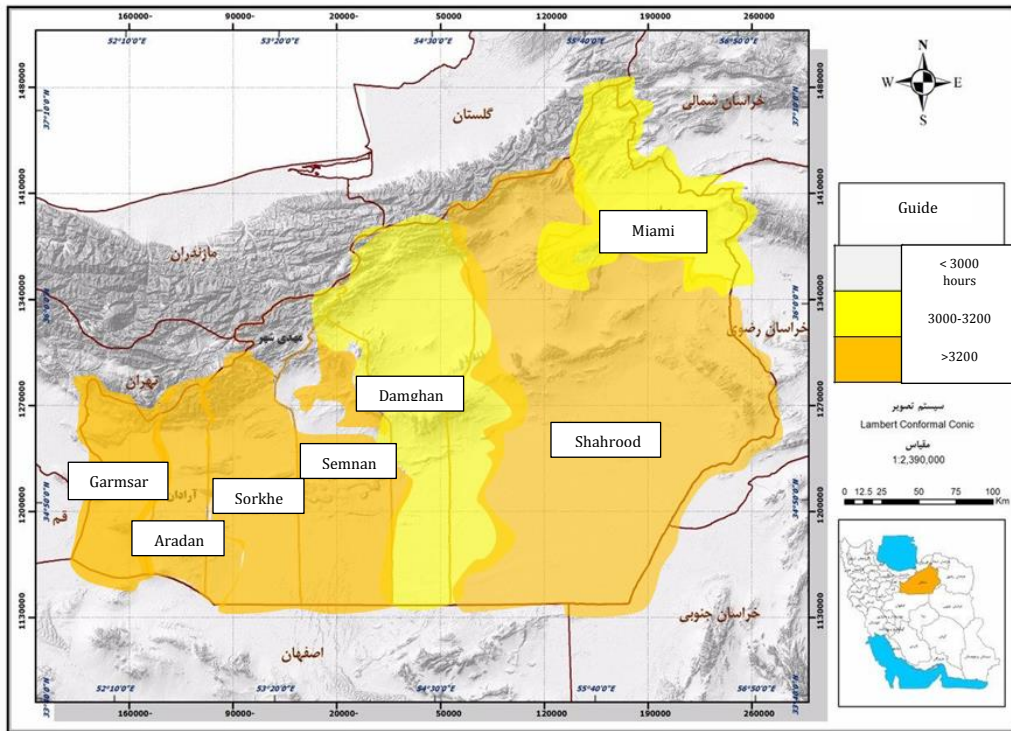


Figure 6) sunny hours in the studied area

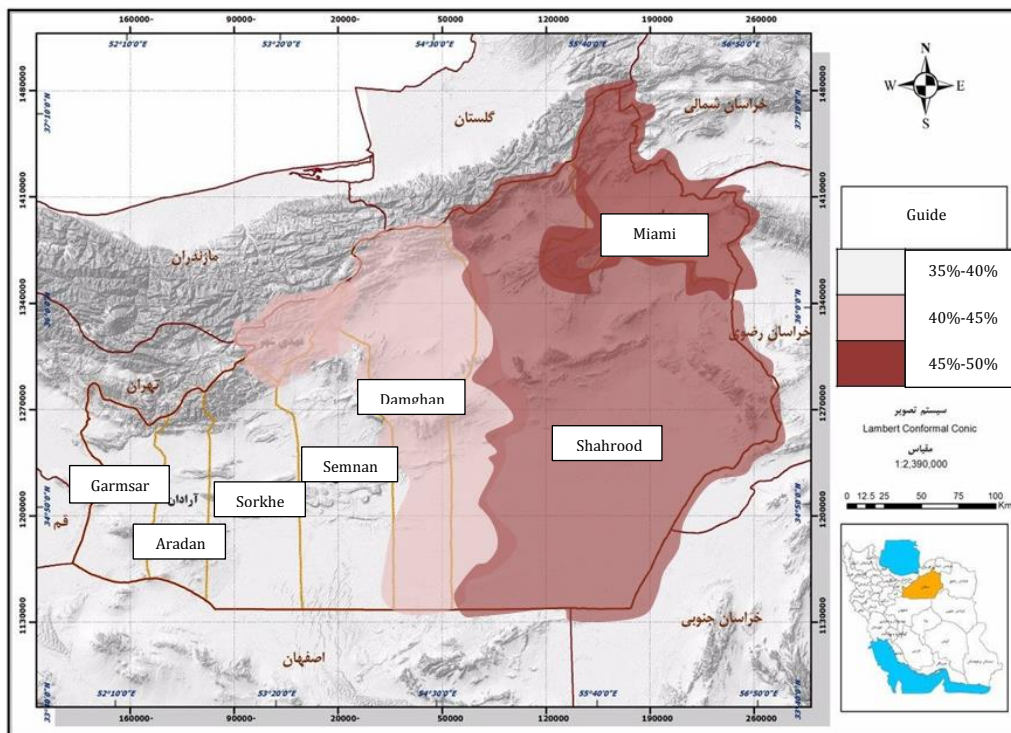


Figure 7) relative humidity zones in the studied area

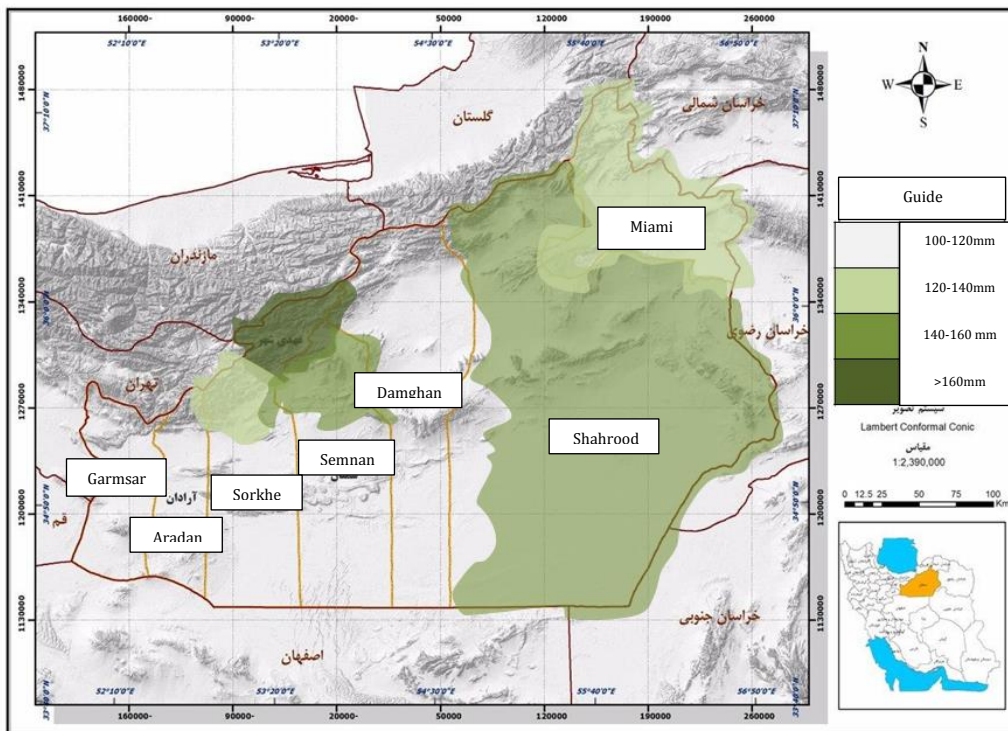


Figure 8) precipitation distribution map in the studied area

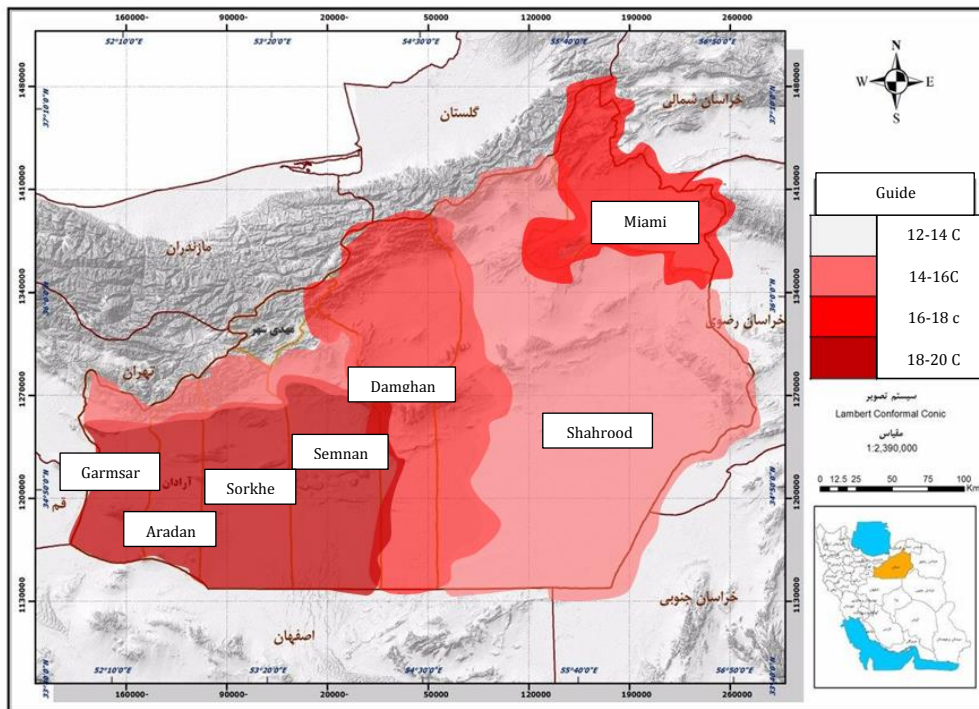


Figure 9) temperature zoning map in the studied area

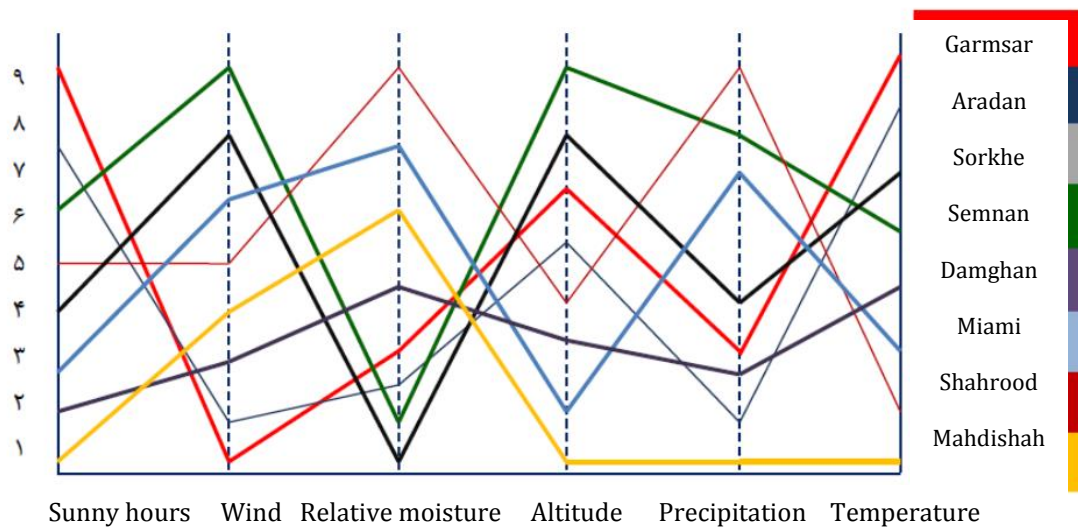


Figure 10) Semnan cities' comparative graph according to eight indicators of the wind-catchers location

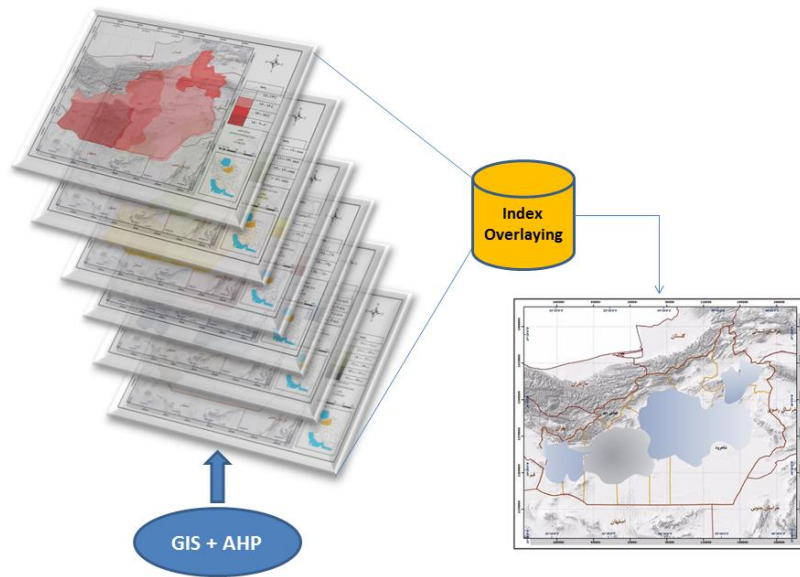


Figure 11) the process of information layers' overlaying and making the final map of the optimum locations for wind-catchers establishment

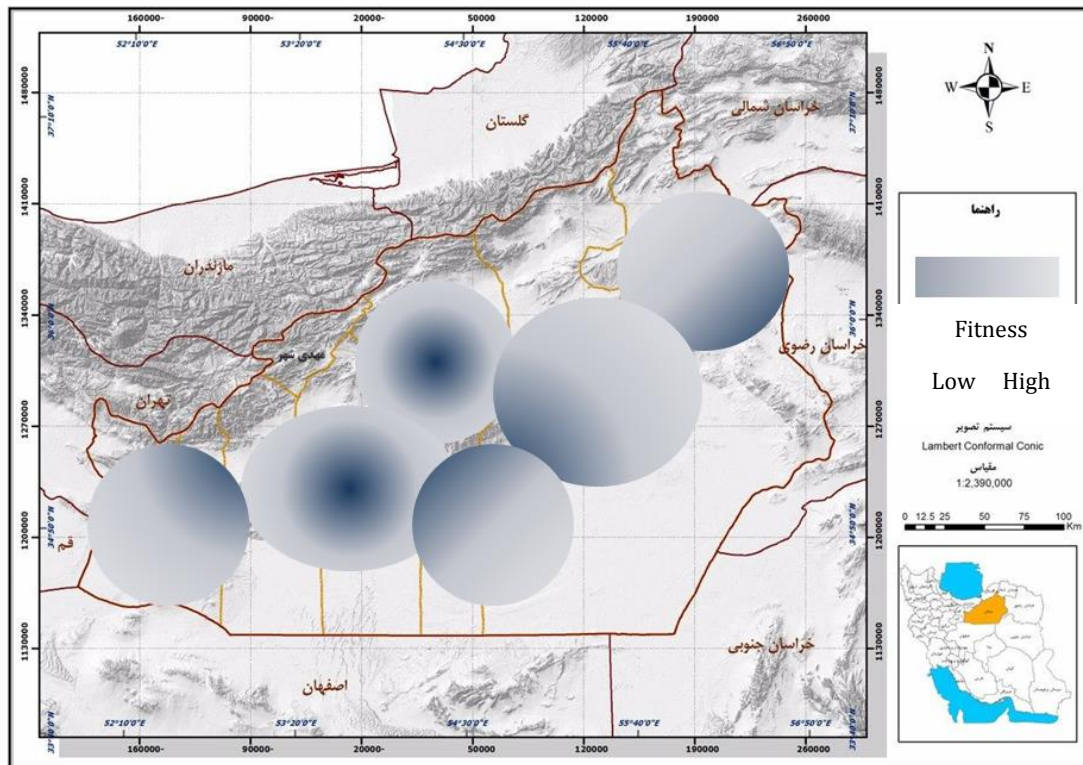


Figure 12) final map of the proper locations for wind-catchers establishment