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Evaluation and Mapping Current Status of Desertification Using ICD and MICD Models in Niatak-Sistan Region, Iran

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Abstract: There are most models for evaluating and mapping sensitive areas to desertification, such as global FAO-UNEP method. In Iran, several models are also used for evaluation desertification intensity. In this study, two ICD[1] and MICD[2] methods were used. In this research, the first step, these models were considered and tried to apply some changes in indices and factors regarding the current situation of the region. Next step, work units (facieses) map of this region was prepared based on the geomorphologic studies. This map has 8 working unit and then type of land use each of working unit was determinate. At last, evaluation of desertification intensity was determined in this region by ICD and MICD methods. Result from both models indicated that according to ICD method, study area was classified into three classes low, medium and severe. So that, low class is about 419.65 hectare (8.7%), the medium class is about 3336.73 hectare (69.2%) and severe class is about 1063.62 hectare (22.1%) of total area. In MICD method, this region has four classes of calm, low, medium and very severe. The low class is about 1150 hectare (23.9%), moderate class is about 825.17 hectare (17.1%), severe class is about 2385.80 hectare (49.5%) and very severe class is about 459.03 hectare (9.5%). According to the results of this investigation and comparing them with the local condition which have been observed in the Niatak-Sistan region, the MICD is determined as better method for evaluation status of desertification in this region. It also revealed that environmental factors contribute to the desertification process much more effectively than anthropogenic factors do.

Key words: Desertification · FAO-UNEP method · MICD model · ICD model · Niatak-Sistan region · Iran

INTERDUCTION

Desertification, land degradation in arid, semi-arid and dry sub-humid regions, is a global environmental problem. Accurate assessment of the status, change and trend of desertification will be instrumental in developing global actions to prevent and eradicate the problem. With the world's population sharp growth and the change of global climate and environment, the harm of land desertification is getting increasingly obvious that through them the land desertification can cause poverty and poverty can cause further desertification. About 2 billion people are potential victims of the effects of desertification. Desertification contributes to internal displacement and international migration of people and if its rate remains unchecked, 50 million people will be displaced over the next 10 years. 40% of the earth's land, or 5.2 billion hectares, is threatened by desertification and every year about 12 million hectares worldwide are lost to land degradation and the rate is increasing 90% of dry land populations live in developing countries and by 2025 more than 2.8 billion people in 48 countries are expected to face water stress or scarcity [1]. About 80% of Iran is located in arid and semi-arid region and a third of its area is exposed to the threat of desertification [2]. Dust storms are a recurring phenomenon in south-west Asia, including Iran. Such storms are a problem especially in the eastern provinces of Iran such as Sis tan and Baluchistan which are most affected by water shortages and frequent droughts [3], deserts cover about 20% of Iran's area and rangelands 55%, with the rest being agriculture (11%), forests (8%) and industrial and residential areas (6%) [4].

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Fig. 1: Influx of mobile sand into residential areas in Niatak-Sistan region

With attention turning to the increasing area of deserts on Iran, it is necessary to first identify areas liable to desertification before identifying mitigation and control measures. For this purpose it is necessary to identify the areas sensitive to desertification. For example, according to the recent investigation of Zabol city located in the south east of Iran, damages and losses rate by wind erosion to communication roads, defying the mobile sands of residential area, closing schools and postpone airplane flights more than billion dollars 17.735 has been estimated [5].

The land desertification has become one of the most serious ecological economic problems in Niatak region. It is restricting the industrial and agricultural production and the economic development in this region. Farmers' poverty elimination action is affected badly by it. As a result, it is considered as an urgent demand to master the change tendency of land desertification in this region. On this basis, the driving forces need to be researched on. It may provide vigorous scientific and technological support to this region. It may also play an important role in controlling and forecasting the land desertification and ensuring the ecological safety this region, so as to promote harmony development between man and nature. Wind erosion in deserts areas has much over which tend to destroy the land. Major factors in wind erosion are intensity and duration of wind, physical and chemical properties of soil, topography, vegetation cover and so on which all interact with each other [6]. Desertification can be observed through destructive and can be measured by quality and quantitative models. There have been many attempts to assess the extent, nature and rate of desertification on global, regional and local levels [7]. These studies are instrumental in understanding desertification myths and in effectively fighting the destruction. The earliest assessment can be dated back to Lamprey's research in central western Sudan, when he introduced the desert encroachment theory [8, 9]. In Iran there are several models that assessment desertification severity [10]. Developed the ICD (Iranian Classification Deserts) model for the classification of Iranian deserts. One of the advantages of the ICD model is its capability to identify the type of desert environment such as environmental and anthropogenic deserts. ICD model was developed in four steps: separation of deserts types using plant types and land use maps, determination of desertification causes including the major and minor causes, classification of desertification and desertification mapping. This method classifies of desertification intensity to five classes: slight, low, moderate, severe and very severe. Also, [10] developed the MICD (Modified Iranian Classification Deserts) model. The purpose of this research is to survey current status desertification of Niatak - Sis tan region, by ICD and MICD models, Which is considerable and administrative for priority of combat desertification, including mechanical– biological fight, in the from combat desertification plans with emphasis on technical interpretation and economic- social indices in Sis tan region. In Iran, these models were used in the Kasha region [11]. Mahan basin, Kerman Province [12]. Fkhrabad-Mehriz basin, Yazd Province (Ahmadi *et al.*, 2005), Kohdasht basin, Loretta Province [13]. In this study, work unit map by overlaying geomorphology, land use and plant cover maps was prepared. Then, were selected of parameters affecting on desertification process and have been assessed severe of each factors on desertification according facies and prepared maps (parameters have been considered as one index). Finally, according to ICD and MICD methods study area were classified.

In this study after reviews the various methods, such as FAO-UNEP, MEDALUS, ICD and MICD methods, tow ICD and MICD methods to assess and preparation desertification map (with emphasis on wind erosion) were selected.

The Goal of the Research:

- Survey efficiency, strengths and weaknesses point of the study methods.
- Mapping the current status of desertification with emphasis on wind erosion in the study area using the methods of choice to set priorities corrective actions.
- Most important factors determination desertification (environmental or anthropogenic) in the study area.
- Find out the most important main and minor factors affecting in desertification process.
- Introduction of appropriate criteria and indicators attention to the study area.

MATERIALS AND METHODS

Study Area: The study area is located in the east Zabol city, Sis tan and Baluchistan province, near the Iranian- Afghanistan border. It covers about 4820 hectare and it average elevation is 470 meter above sea level. The area pertains to 61" 36 33 to 61" 41 56 and 30 59 05 to 31 07 23 longitude and latitude, respectively (Fig. 2).

Sis tan region on the world Desert Belt and has an arid and semi-arid climate. The aridity of the climate is manifested by very low precipitation (57 mm), low air humidity, low cloudiness, high evaporation rates (nearly 5000 mm), high annual temperature (22°C) and frequent droughts. The region is subject to severe winds; occasionally wind speeds reach 120 km per hour. The 1999 drought which caused the Hamsun Lake to dry up and also changed the land use from agricultural to abandon land has increased the susceptibility of the soil to erosion. The area subject to soil erosion has increased which is also, in turn, a cause for dust storms. Figure 3 shows the Hamsun Lake before and after the drought [14].

Stage Status of Desertification Assessment to ICD Method

Determination and Separation Type of Desert Environment: At this stage, to help basic studies such as plant types, land use maps and other perspective of desert, type of desert environment were separated and the assessment of desertification was made in all of them. Notable in working unit determination, it is that due to the same region from the standpoint of glottology and slope, Geomorphology facies were identified as the study basic unit. To this end, addition to field surveys from Un Supervised Classification method using ERDAS 9.1 software on Hindi satellite images for the year 2006 were used. Finally, eight desert homogeneous units were separated in the study area (Table 1 & Fig. 4). Type of desert environment showed in the Table 2.

Type of desert environment in the ICD method as following marked and as work unit in the assessment type of desert environment and desertification intensity are considered.

- Wild Lands Plant including: Lands with Natural plant (P); forest (P/F) and Range (P/R), Lands with the artificial plant (AP); Forest (ap/F) and Range (ap/R).
- Bare Lands (B) including: mountain (BM), salty Lands (Bs), clay lands (BC), bad land (Bb), sand dune (Bs.d).
- Agricultural Lands including: Agricultural irrigation (Ai), Agricultural non irrigation (Ad), habitat and building (Ab).

Determination Main and Minor Factors Affecting in Desertification: In this stage, effecting factors on desertification including three environmental factors, three anthropogenic factors and desertification indices were scored in a range of 0-10. Afterward, according to the sum of scores and comparing with table of desertification intensity (Table 3), final desertification map was produced.

Environmental factors (E) in ICD method include climate(C) geomorphologic (G) and water and soil resources (Q) that have formed of sub factors. Climatic factors include rain(r) and drought (dr). Geomorphologic factors include topography (t) and geology (g). Water and soil resources include quantitative restrictions (qt) and qualitative restrictions (ql) [15].

Anthropogenic factors (A) include plant resources degradation (P.d) water resources degradation (W.d) land and soil resources deterioration (L.a) that have formed of sub factors. Plant resources degradation factor includes cutting trees and shrubs (cu), over grazing (gr) Afforestation and unsuitable agricultural patterns (pa), water resources degradation factor divided into two sub factor pumping and decline groundwater levels (pu)

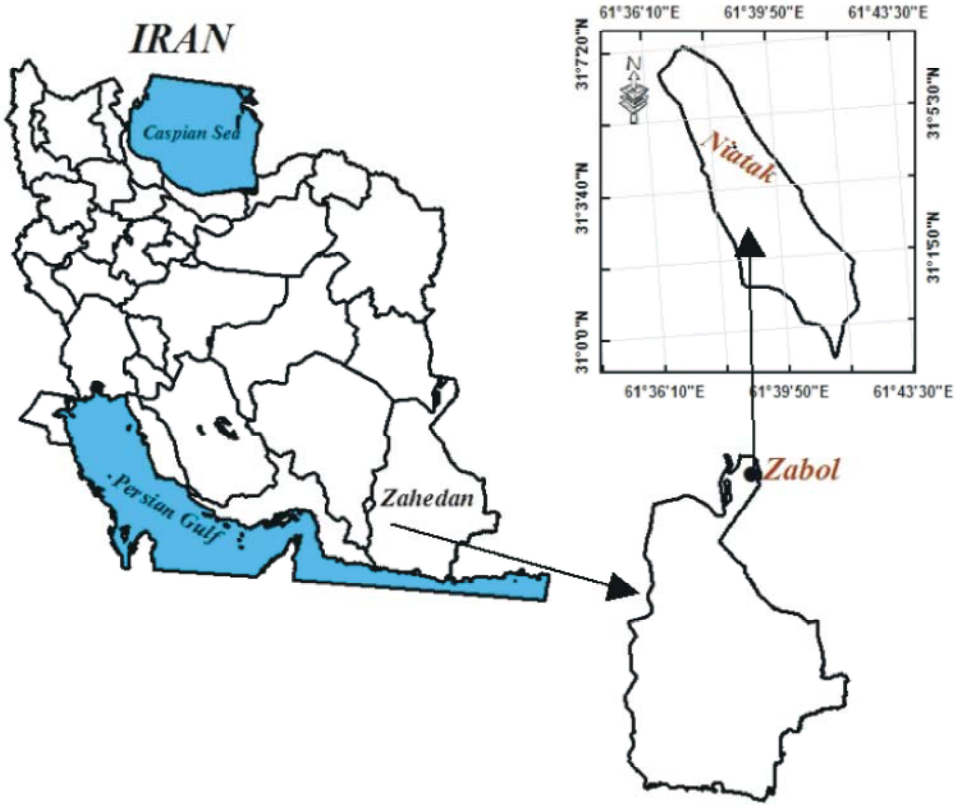

Fig. 2: The position of study area

Picture (a) Picture (b)

Fig. 3: Views of Hamoun Lake: (a) before the drought; (b) after the drought

Table 1: Geomorphology Units of Niatak-Sistan region based on the geomorphologic studies

Geomorphology Unit's Name & Code		Geomorphology Type's Name & Code		Geomorphology Profile 's Name & Code	
Code	Unit	Code	Type	Code	Profile's Name
1	Plain	1-1	Covered Plains	1-1-1	Nebka-Clay Plain-Sand dune
				1-1-2	Riparian of Niatak River
				1-1-3	Mulch Covered Lands
				1-1-4	Sand dunes
				1-1-5	Niatak River Bed
				1-1-6	Bar khan
				1-1-7	Clay Plain
				1-1-8	Irrigation Agricultural Lands

Source: Research Findings

Table 2: Type of desert land escapes of Niatak-Sistan region

Row		Desert Land Escapes		Mark	Code
1	Wild Lands Plant	Natural plant(P)	Nebka-Clay Plain-Sand dune	P/R	1-1-1
			Riparian of Niatak River	P/F	1-1-2
		Artificial plant(ap)	Mulch Covered Lands	ap/f	1-1-3
2	Bare Land (B)		Sand dunes	B/s.d	1-1-4
			Niatak River Bed	B/r	1-1-5
			Bar khan	B/b	1-1-6
			Clay Plain	B/c	1-1-7
3	Agricultural Land(A)		Irrigation Agricultural Lands	A/I	1-1-8

Table 3: Desertification intensity quantitative scores range and qualitative classes in ICD method

Desertification intensity	Range	Class
Slow	0 - 15	I
Low	15 - 30	II
Moderate	30 - 45	III
Severe	45 - 60	IV
Very sever	60 - 80	V

(Source: Ekhtesasi and Mohajeri, 1995, Classification method and type of desertification intensity for lands in Iran)

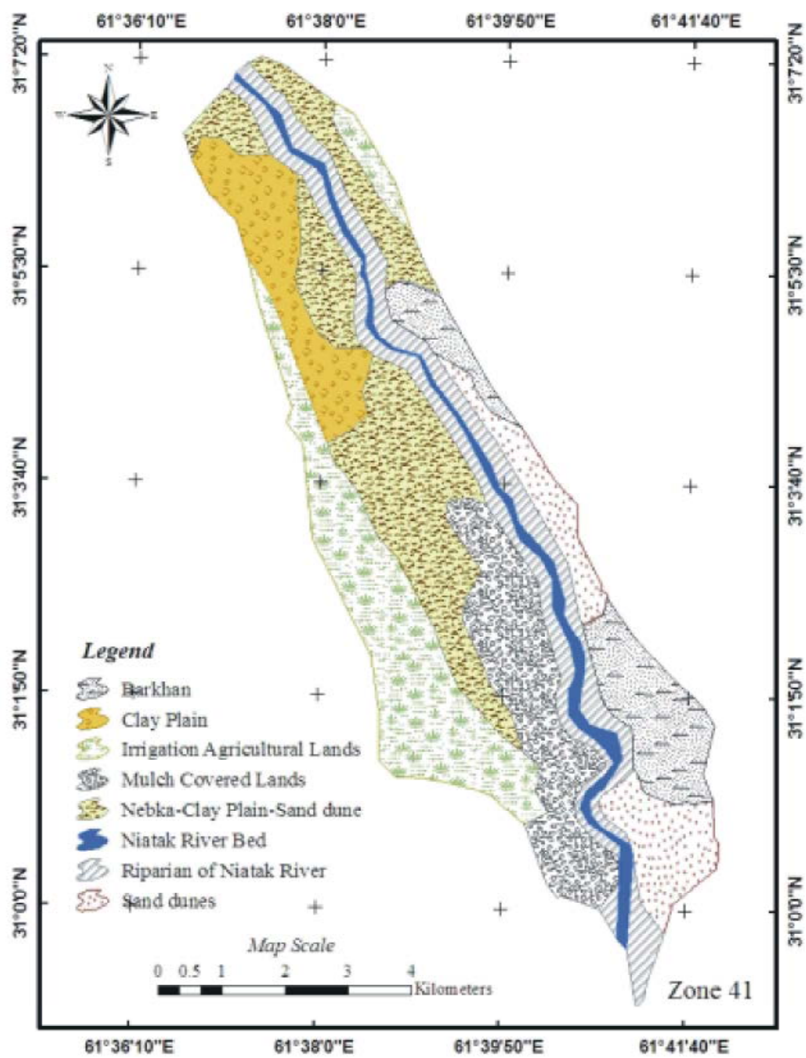

Fig. 4: works Unit map of Niatak-Sistan region, Iran

Table 4: Desertification intensity quantitative scores range and qualitative classes in MICD method

Desertification intensity	Range	Classes
Slow (Calm)	0 - 5.6	I
Low	5.6 - 11.2	II
Moderate	11.2 - 16.8	III
Severe	16.8 - 22.4	IV
Very severe	22.4 - 28	V

(Source: Ekhtesasi and Ahmadi, 2004, Classification method and type of desertification intensity for lands in Iran)

Table 5: Quantitative Value of Environmental Factors related to ICD model in Niatak-Sistan region

Unit Work Code	Climatic (C)	Geomorphology (G)	Quantity and Quality of Water- Soil Resources (Q)
1-1-1	6.25	4.25	8.5
1-1-2	3.4	2	8.5
1-1-3	6.5	2.5	8.5
1-1-4	8	4.75	8.5
1-1-5	2.75	2.75	8.5
1-1-6	8.25	5.5	8.5
1-1-7	5	3.5	8.5
1-1-8	2.9	2	8.5

Table 6: Quantitative Value of Anthropogenic Factors related to ICD model in Niatak-Sistan region

Unit Work Code	Soil & land resources degradation (w.d)	Water Resources (w.l)	Plant Sources (p.d)
1-1-1	8.25	0	8.25
1-1-2	7	1	4
1-1-3	6.25	0	8.25
1-1-4	0	0	0
1-1-5	5.5	2	3.5
1-1-6	0	0	0
1-1-7	0	0	0
1-1-8	7	8.75	6.75

Table 7: Quantitative Value of Desertification Indices Factors related to ICD model in Niatak-Sistan region

Unit Work Code	Soil Erosion (s.e)	Desertification Combat Possibility (a. a)
1-1-1	7.5	6.5
1-1-2	4	4
1-1-3	5	5
1-1-4	8.5	7
1-1-5	4.5	3
1-1-6	9.5	8.5
1-1-7	3	3.5
1-1-8	3	3

Table 8: Result of Intensity and Factors desertification in Niatak-Sistan region by ICD Method

Unit Work Code	Quantitative Value of Environmental Factors	Quantitative Value of Anthropogenic Factors	Quantitative Value of Desertification Indices	Quantitative Value of Desertification Intensity	Desertification Intensity Class	Illustration of Current Desertification Position on Map
1-1-1	19	16.5	14	49.5	IV	(IV-P/r)/E-C(dr)
1-1-2	13.9	12	8	33.9	III	(III-P/f)/E-C(dr)
1-1-3	17.5	14.5	10	42	III	(III-Ap/f)/E-C(dr)
1-1-4	21.25	0	15.5	36.75	III	(IV-B/s.d)/E-C(dr)
1-1-5	14	11	7.5	32.5	III	(III-P/r)/E-C(dr)
1-1-6	22.25	0	18	40.25	III	(V-B/b)/E-C(dr)
1-1-7	17	0	6.5	23. 5	II	(III-B/c)/E-C(dr)
1-1-8	13.4	22.5	6	41.9	III	(III-A/I)/A-w.d(pu)

Increase water table and false irrigation system (i) and land and soil recourses degradation factor including incorrect plow and long-term fallows (pl) and converting of forests and rangelands to farmlands or urban areas (ch). Afterward, according to the sum of scores and comparing with table of desertification intensity, final desertification map was produced [10].

Evaluation the Desertification Intensity: Because of that erosion intensity and resilience potential can in more accurate estimating the land desertification severity is effectively, in addition to anthropogenic and environmental factors, two erosion intensity and resilience potential and reconstruction of ecosystem or combat desertification indices, which, respectively, with a. at and s.e are displayed based on the base table scoring were (Table 7). And, at next step with sum of the total scores achieved from environmental factors (E), anthropogenic factors (A) and desertification indices (I), score of each work unit was obtained by using following formula below (Table 8). Finally, using of classification table of desertification intensity, desertification intensity class for each work unit is determined (Table 3).

Desertification Intensity = environmental factors+ anthropogenic factors+ desertification indices

Mapping Desertification: After evaluation each of desert units, in order to status of desertification map preparation, first, all work units that have the same desertification intensity class was sit in a range. Then according to type of deserts environment and major and minor factors effecting on desertification was separated to smaller areas. Finally, desertification intensity, type of deserts environment and effecting factors on desertification are calculated and plotted by using following formula below on final map.

Desertification intensity / Type of desert
Major factors (A or E)/ Minor factors

Stage Status Desertification Assessment to MICD Method

Determination and Separation Type of Deserts Environment: To evaluation desertification to MICD method with emphasis on wind erosion similar to ICD method, first, various land uses in region determination and then geomorphology facies map for scoring to indices related to factors were prepared. In this method, type of land uses in the different parts of region to help land use and plant cover maps determination and in the three groups, agricultural lands, forest and range lands and non-land use lands were classified.

Indices Scoring: MICD method for each land use mentioned, special indicators suggest that after scoring the indicators, in end with sum of the scores given for each land use, determination feasibility desertification intensity and status region map is provided (Tables 9, 10 & 11). disassociate land uses and indicators related to them from each other, this possibility provides the can be assessed and scoring for indicators that are more important in desertification because all indicators of desertification, which are important for agriculture lands in non-land use lands and forest and range lands are unimportant and contrariwise.

Table 9: Current status of desertification evaluation caused by wind erosion on non-land use area

Index Type	Bar khan	Sand dunes	Clay Plain
Effective plant cover Or Gravel density (larger than 2 mm in the soil surface)	4	3.5	1.25
Plant survival in time soil surface	2.5	1.5	1
Confusion signs due to tool and animal traffics	4	3	2
Continual of wind blow more than threshold speed (6 m/s in 10 m height)	2	1.5	2.75
Wind erosive effects on soil and making Yarandang and Kalut on the soil surface	4	3.5	1
Pressure persistence of soil in dry conditions	4	3.5	1.25
Sing of (wind) sand mass at the bottom of the plants of the stones	3	3	1.25
Total value	23.5	19.5	10.5
Desertification Intensity	V	IV	II

Table 10: Current status of desertification evaluation caused by wind erosion on forest and range Land use

Index Type	Riparian of Niatak River	Mulch Covered Lands	Nebka-Clay Plain-Sand dune	Niatak River Bed
Index type	1	1	1	1
Planting models in lands under cultivating	1	2	1.25	2
Windbreak condition around the farms	3	3	3	3
Soil and earth management	1. 5	1.5	2.9	2.5
Soil texture	1.15	3	3	2
Plant remains management	2.5	3	3.75	1.75
Soil humidity and irrigation duration	1	1.75	2	1.25
Total value	11.15	15.25	16.9	13.5
Desertification Intensity	II	III	IV	III

Table 11: Current status of desertification evaluation caused by wind erosion on agricultural Land use

Index Type	Irrigation Agricultural Lands
Index type	2.5
Surface condition of soil	3
Confusion signs due to tool and animal traffics	1.5
Continual of wind blow more than threshold speed (6 m/s in 10 m height)	3
Wind erosive effects on soil and making Yarandang and Kalut on the soil surface	3
Pressure persistence of soil in dry conditions	2.5
Signs of sand mass at the bottom of plants or stones	3
Total value	18.5
Desertification Intensity	IV

Due to is not identical indicators in different land uses, use from classification table desertification intensity on the basis sum of the scores examined factors, would be impossible and therefore before status of desertification assess in the study area, proceeding to equivalent the indicators number in all land sues. Thus in the table related to present status of desertification assess in non-land use lands, soil texture index was added and also in the table related to forest and range lands, plant cover density index and gravel density index (greater than 2 mm), Were in a group (Hosseini, 2008). According to this model, desertification process has been classified in 5 classes involved Slow (Calm), low, moderate, severe and very severe (Table 4).

RESULTS AND DISCUSSION

Study area belongs to cold hyper-arid climate and in terms of rainfall is very poor. Climates, droughts and inadequate rainfall from soil genesis and the establishment of appropriate vegetation in the region prevented. Destruction process is so increasingly, due to recent aero logical and hydrological drought, changing land use and range destruction, sand taking from the lake bottom and making sand dunes in farms. All these factors contribute to increased desertification

Results of ICD Method: To investigate the status of desertification in study region to help geomorphologic, land use and plant cover maps, 8 working units of separation and desired factors in each unit were evaluated on the basis of tables designed. Result obtained of status of desertification assess by ICD method in Tables 5, 6 and 7 are provided. Finally, attention to results obtained current status of desertification map by ICD model in the region of Niatak- Sis tan were obtained (Fig. 5). Based on this method study region is in three classes low, medium and severe. In this region the low class is about 419.65 hectare (8.7%), the medium class is about 3336.73 hectare (69.2%) and severe class is about 1063.62 hectare (22.1%) of total area. The results indicated that the desertification dominant factor in the ICD method, environmental factors and region is except natural desert [16].

About climate study area can be mentioned so low precipitation (57 mm) and also the continuing drought periods. Drought is climate, hydrological, agricultural and ultimately economic – social in the study area that attention to the available evidence scoring to these factors was done with expertise vision. About geomorphology factor has, no topography phenomenon in the study area, so that changes of slope are inappreciable and very small in the plains (changes of slope<0.06%). Situation soil and water resources due to the lithology special structure region such as fine sediment can be no exploitation of underground water resources and region water resources is restricted to the surface and underground water. A part of major is the surface water related to Hirmand River and attention to disregard Iran water rights by Afghanistan country (water allocation 26 m^3/s to Iran) and also recent droughts has been faced with serious restrictions and water crisis in the region has intensified. Human factors and plant resources degradation, especially over cutting trees and shrubs to aim fuel preparation and also over grazing due to lack of sufficient forage from one side and imbalance livestock and pasture range land, the other hand natural resources destruction has intensified. As mentioned, due to recent drought and drying Hamoun Lake, region microclimate were severely affected and the 120-day winds (Louver) carries sediment and wind erosion has gone so far as the majority of agricultural land convert to sedimentation region or Erg has been. And land use change what has been mentioned in the model (Converting agricultural land to forest, range land, abandoned and no land use lands) is true in the region. As desertification indices, particularly resilience potential and reclamation of ecosystem with emphasis on technical and economic justification, the parts of area Haloxylon artificiality forest created and in contrast to restoration projects have failed in the other parts of areas. That in the scoring desertification indices was considered.

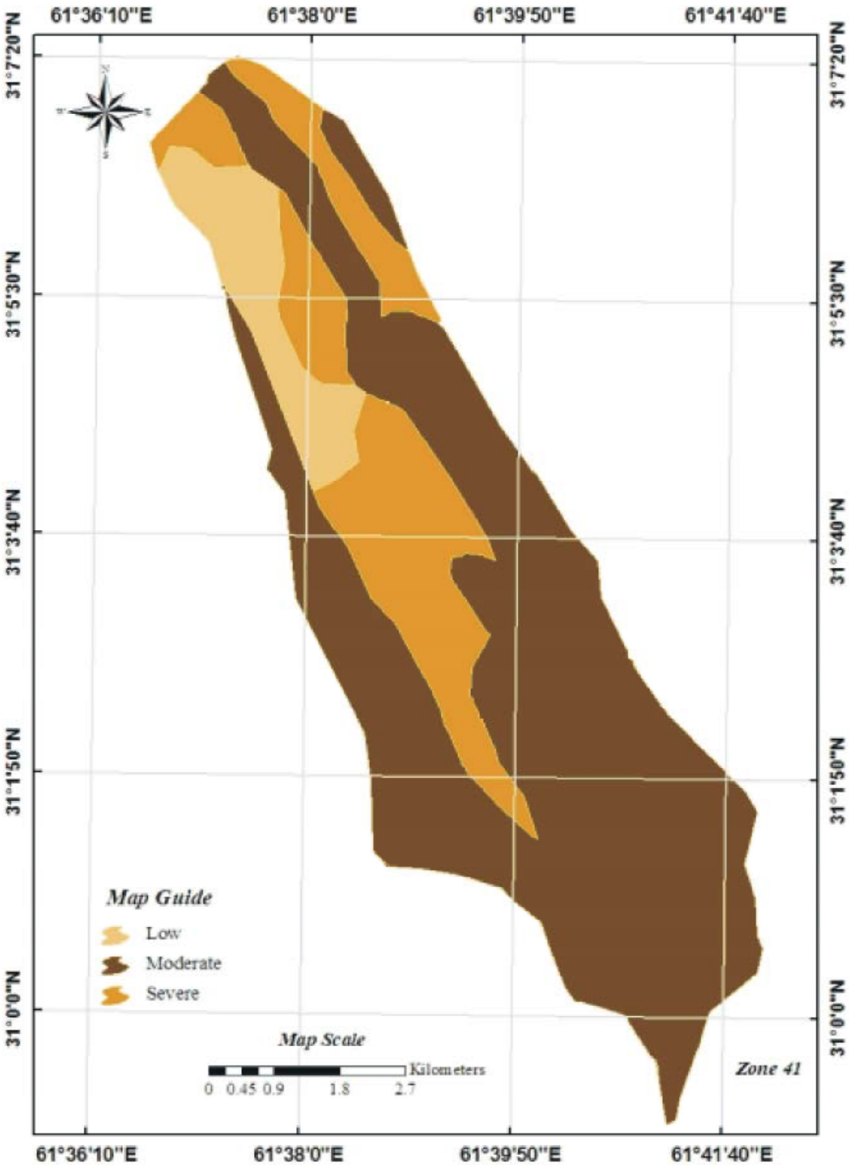

Fig. 5: Final map of status of desertification in Niatak-Sistan region, Iran by ICD method

According to was evaluate in the study region the results shows that land degradation intensity in all work units was calcified into three classes low, moderate and severe. So that the working unit 1 with a quantitative value of 49.5 in the result of sums various factors with maximum quantitative values are placed in first priority of degradation. The work units 7 with quantitative minimum values lower priority. Results also showed that environmental factors were as the main factor in desertification of 81.7 % area of the studied region while 18.3 % of that was affected by anthropogenic factors. Most main criterion in desertification of this region was drought process.

Results of MICD Method: Rating calculated in this method is thus type of land uses in the various parts of the region to help land use and plant cover maps determinate and separated and afterward in the three groups, agricultural lands, forest and range lands and non-land use areas were classified. Specific indicators score related to each of land uses in Tables 9, 10 and 11 are presented. According to total scores given to these indicators and Table 4 was determined for each of land uses the current status of desertification map (Fig. 6). The results showed that in MICD method, this region has four classes of low, medium, severe and very severe.

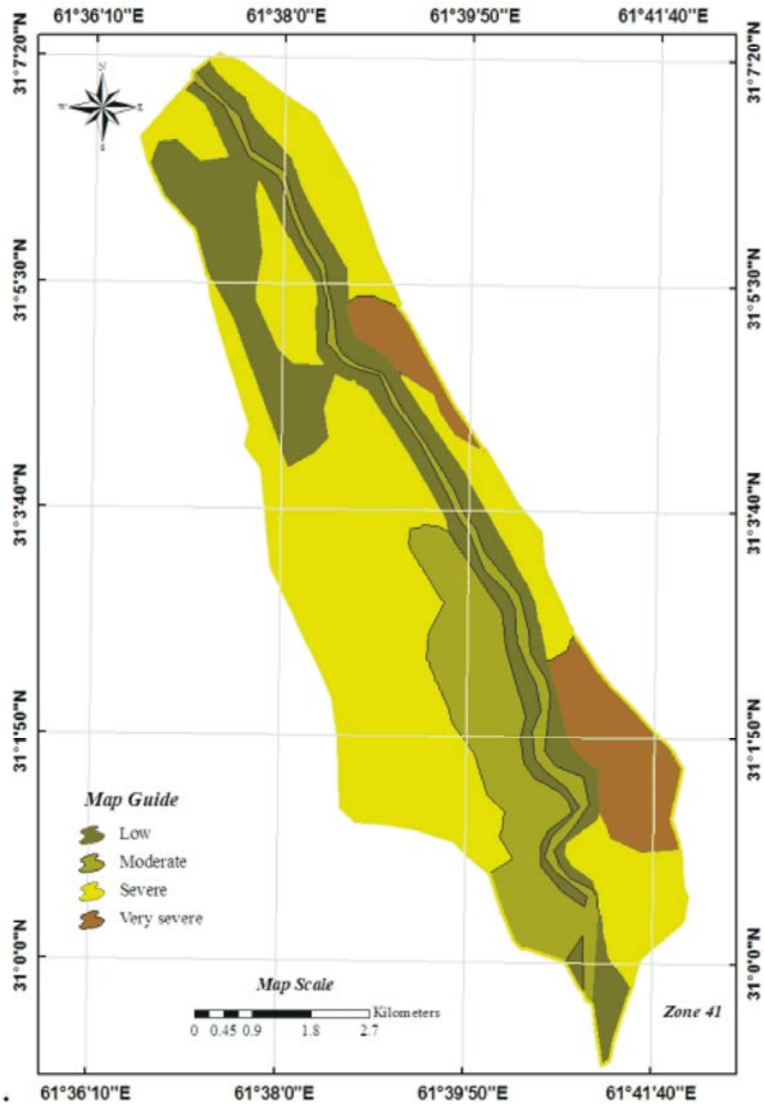

Fig. 6: Final map of status desertification in Niatak-Sistan region, Iran by MICD method

The low class is about 1150 hectare (23.9%), moderate class is about 825.16 hectare (17.1%), severe class is about 2385.80 hectare (49.5%) and very sever class is about 459.03 hectare (9.5%).

CONCLUSION

Results of these two methods are different from each other, so that in ICD method is study area in three classes low, moderate and severe and in MICD method; this region has four classes calm, low, medium and very severe. By comparing the results of two ICD and MICD methods and comparing them with the condition which have been observed in the Niatak-Sistan region, the MICD is determined as better method for evaluation of status desertification in this region. So that, MICD method can be used as appropriate method for evaluation the potential of desertification intensity in regions with the similar characteristics. Because to this methods status desertification, with emphasis on wind erosion is determined, the only factors that affecting in wind erosion are, evaluate and scoring was and for scoring from many factors that will cause impact on each other and possibly intensifying or mitigate the impact each other were refused.

Regarding to do surveys in this research can be mention following advantage to ICD method:

- Comprehensive and step by step is, thus expert error in this method is less.

- With Iran conditions has conform.
- Ease in evaluation and separate types of desert environments including anthropogenic and environmental, which is used in planning the next.
- Accuracy increase studies in determining priority factors affecting in desertification to weighted scales method.
- Mapping possible types of desert environments and desertification intensity.
- The most important feature of this method that this method distinguish than other methods, adaptability and consistency with the Iranian desert biomes, For example, the degradation of water resources (water table decline) in this method as a factor studied that this case in other methods (such as FAO-UNEP) has not been mentioned.

This method also has disadvantages are that can be expressed as follow:

- Some of the factors examined in this model to assess and scoring quality are that this will reduce the accuracy of scoring.
- Rates range is in different classes of this model widespread.
- Some of factors are scoring iterative in ICD model.
- In ICD model, due to human factors do not affected in the desertification in non vegetation areas, score related to environmental factors are multiplied in two number. This causes the effecting environmental factors and desertification intensity in these areas will be doubled, that this problem is not without difficulty.

As described in this research was try to some of the disadvantages of this method is correct for the region.

Advantages MICD Method Including:

- One of important things in this method is regard to selection criteria and indicators for desertification assessed according to the type of land use. Due to processes and indicators for desertification verified based on change type of land use.
- Because to this methods status desertification, with emphasis on wind erosion is determined, the only factors that affecting in wind erosion are, evaluate and scoring was and for scoring from many factors that will cause impact on each other and possibly intensifying or mitigate the impact each other were refused.

From disadvantages this method are not identical examined indicators numbers in the different land uses. Because of in this method scores range for desertification intensity in each land use, will be different. Ultimately, this problem causes in a current status desertification map, different land uses which are in same desertification intensity classes, in terms of desertification intensity quantitative value in different scoring ranges are. This object comparison status desertification in different land use in a map, impossible. In this research, for this problem resolving proceeding to equivalent the indicators number in all land sues.

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