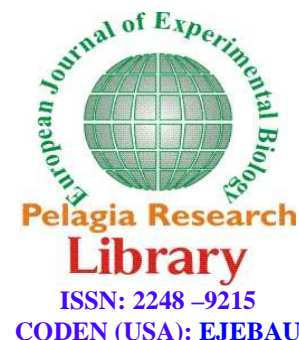




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Identification of wind affected regions in Zabol district (Sistan va Baluchestan province, southeast of Iran)

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ABSTRACT

Research has found that in Iranian desert regions the unsurpassed way to deal with wind erosion might be bringing the detachment area's erosion to a halt. In addition to less cost of coping with wind erosion at the detachment area, the chance of success might be higher though some deposition areas have faced up with a high devastating force of wind shear that mitigation in these regions is of higher priority. Hence in the current work we are seeking to identify hazard zones of wind erosion in Zabol district and priority them. In order to identify hazard zones in Sistan plateau, source tracking of sand dunes in Iran (Ekhtesasi-Ahmadi proposed method) was conducted. This method considers influential factors in determining detachment regions and encompasses a regular and step-wise path to identify detachment, transportation and deposition zones of wind erosion. To track the source areas different criteria were regarded as field observatories and questionnaires, morphological analysis of sand dunes, and analysis of wind regimes to ascertain the prevailing winds. According to the studies this was concluded that Sistan plateau which spans over 15197 square kilometers encloses about 145303 hectares of hazard zones distributed mainly in Jazinak, Niatak and Tasouki-Rigchah. To priority them according to the infrastructures under effect Jazinak comes top and is followed by Niatak and Tasouki-Rigchah.

Keywords: Wind erosion, desertification, hazard zones, and sand dunes.

INTRODUCTION

Wind erosion is main factor of erosion in arid and semiarid region and observed unfavorable landscape of it, are desert sand seas and sand dunes forms [1 and 3]. Wind erosion happened in all arid regions of the world and even in sub humid to humid region and caused to extensive damage. The results of studies showed that damage caused by wind erosion is severe in dry years [5]. Wind erosion is including detachment of soil particles, transport and deposit of soil by wind.

MATERIALS AND METHODS

Site description

This research studied in the Zabol district, in sistana va baluchestan province, southeastern province of Iran (figure 1)

To identify hazard zones of wind erosion in Sistan plateau, Iranian model of source tracking of sand dunes (Ahmadi-Ekhtesasi) was conducted. Being primarily a practical way to originate wind deposits, the Ekhtesasi-Ahmadi method includes influential factors in the identification of detachment regions [6;7 and 8]. Overlooking one influential criteria isn't likely to spark interruption through the process because of so many criteria included to find out the origins of sand deposits and evaluating results' accuracy. More on that, including an assortment of criteria in finding sand deposits' origins causes interactions among the criteria and step the accuracy up. Of the results of adapting such a regular and step-wise pathway, less cost and more simplicity are worthwhile end results [1]. The method could be split up into two separate steps namely source orientation and source site selection. In the source orientation step, field observatories and questionnaires, analysis of satellite imageries for different time steps, morphological analysis of sand dunes, and analysis of wind regimes to ascertain the prevailing wind (according to observatory stations) come into aid. As three wind-affected regions are detected in Zabol plateau, the most proper method for source orientation and the most influential factors determining wind erosion were identified [3 and 4]. The components identified during source orientation in Ekhtesasi-Ahmadi method, include analysis of geomorphological facies prone to erosion with emphasis of the morph dynamic characteristics of wind. In order to make a link between detachment and deposition areas, morphoscopic analysis of sand dune particles and other patches of detachment area is inevitable. So in originating detachment trajectory in susceptible faces, the areas of high sedimentation ratio were identified. According to the reference table the severity in detachment, transition and deposition areas is evaluated. In this manner, detachment area is categorized into severe (o1), medium (o2) and slight (o3), transition is classified into severe (t1) and slight (t2) and deposition (s) is divided into active (s1) and stable (s2). In this investigation, despite the lack of identification of transition areas and given the fact that transition areas act as the detachment areas, these zones are separated as the detachment zones [4, 9, 11 and 15]. After separating the detachment, transition and deposition areas, these are prioritized according to their implications on social characteristics and economical infrastructures and the areas of higher severity are called critical centers. In order to prioritize critical centers of wind erosion in Sistan plateau according to the severity of erosion in the detachment, transition and deposition areas while considering the damages imposed on housings, farms, roads, important economical and biological resources, the study has been carried out.

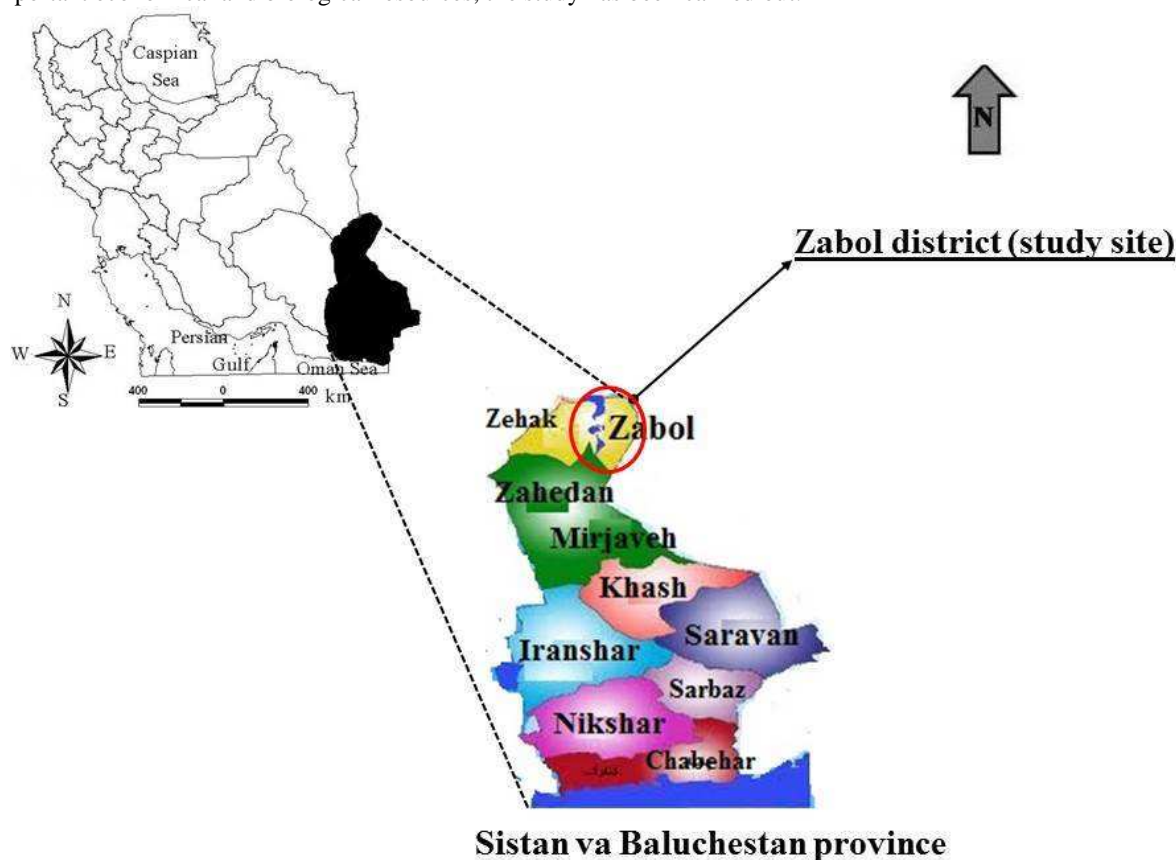


Figure 1: study site location in Zabol district, Sistan va Baluchestan province, southeast of Iran

RESULTS AND DISCUSSION

In this research so described in methodology, two factors are surveyed and identified including: the area that affected by wind erosion and crisis centers of wind erosion in Sistan plain. Therefore obtained result present in two distinct sections.

Identification area affected by wind erosion (detachment, transition and deposition) in sistan plain

From all sistan plain, Jezink, Niatak and Tasugi-rigchah region are faced with the mobile sand dune and wind erosion problem (in the recent years because of continued droughts, Hamoun lake surface is changed to sand detachment place). The figure 1-4 showed area affected by wind erosion in Zabol city and table 1 showed area affected by wind erosion including detachment, transition and deposition region separately.

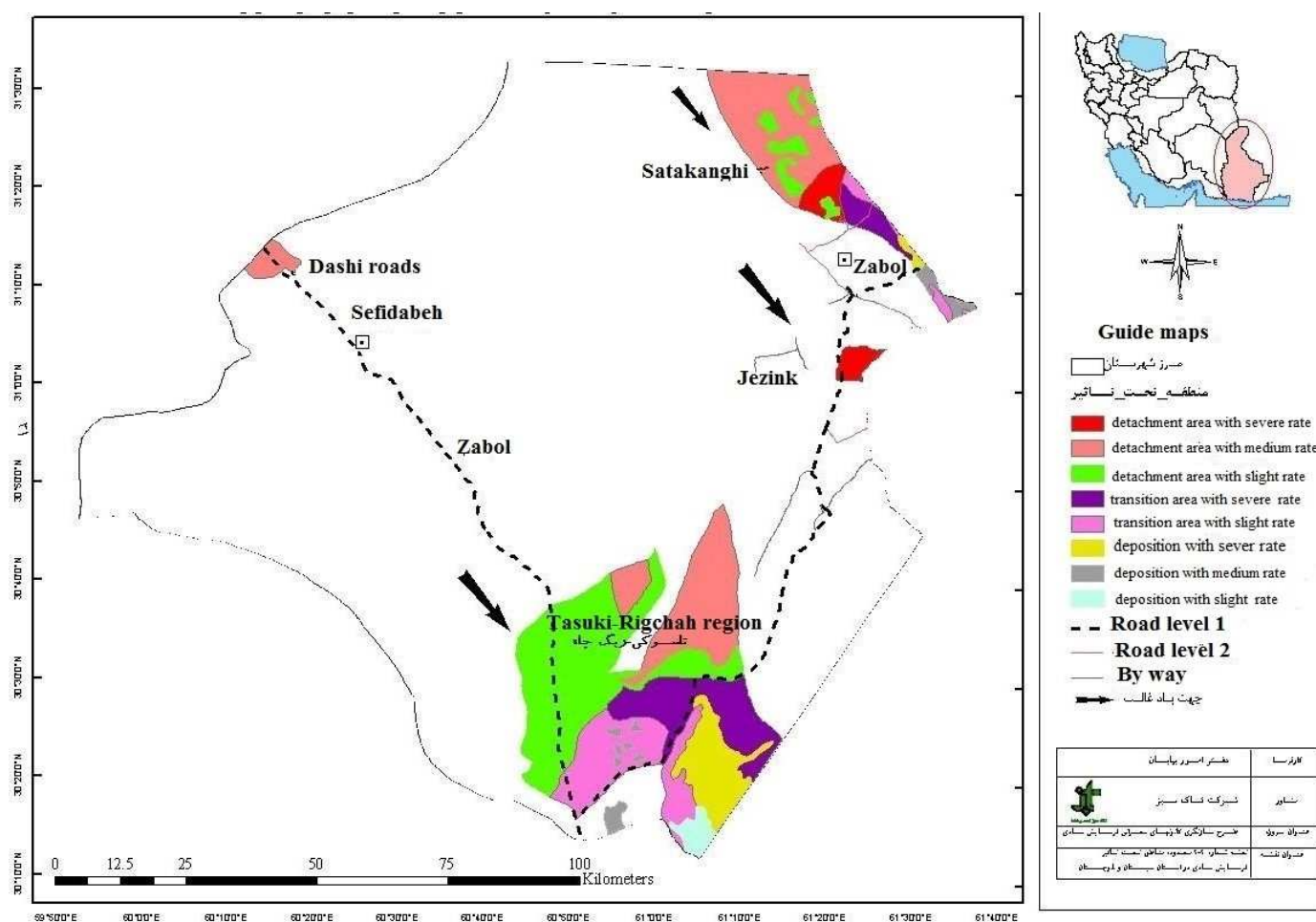


Figure2: the range of area affected by wind erosion in Zabol city

Table1. Affected areas in different areas of detachment, transition and deposition in Sistan plateau

total	Deposition areas (Hectare)				Transition areas (hectares)			Detachment areas (hectares)				Affected areas
	total	S3	S2	S1	total	T2	T1	total	O3	O2	O1	
95920	12739	2107	9227	1405	34529	28279	6250	48652	6318	34834	7500	Niatak
13905	2344	-	1094	1250	5858	2422	3436	5703	-	-	5703	Jazinak
142628	34187	5143	13786	15258	45738	20687	25051	62703	11570	51133	-	Tasouki-Rigchah
252453	49270	7250	24107	17913	86125	51388	34737	117058	17888	85967	13203	Total



Figure 3: scenery of the detachment area of high severity in Zabol district



Figure 4: scenery of transition area with medium severity in Zabol district



Figure 5: scenery of deposition area of slight severity in Zabol district

Table 2: area and position of wind erosion crisis centers together affected biotic and economic sources in Sistan plain.

Total sum	affected area extent with wind erosion (ha)											Prevailing and erosive wind side	Map name and code Topography with scale 250000: 1	area (ha)	Geographic coordination				The name of region affected by wind erosion
	The area of deposition zone				The area of transition zone			The area of detachment zone							width		Length		
	Sum	S ₃	S ₂	S ₁	Sum	T ₂	T ₁	Sum	O ₃	O ₂	O ₁				to	from	to	from	
95920	12739	2107	9227	1405	34529	28279	6250	48652	6318	34843	7500	Northwest	Doust mohammad khan NH41-2 Zehak NH41-6	95920	°25 °31	°48 °30	°48 °62	°13 °61	Miankangi
13905	2344	-	1094	1250	5858	2422	3436	5703	-	-	5703	Northwest	Zehak NH41-6	13905	°55 °30	°45 °30	°44 °61	°29 °61	Jezink
142628	34187	5143	13786	15258	45738	20687	25051	62703	11570	51133	-	Northwest	Hamoun lake NH41-5	142628	°44 °30	°00 °30	°16 °61	°44 °60	Tasugi-rigchah
252453	49270	7250	24107	17913	86125	51388	34737	117058	17888	85967	13203	-	-	252453	-	-	-	-	Sum

Identification crisis centers of wind erosion

Three crisis centers of wind erosion recognized in Sistan plain. These crisis centers are including Jezink, Niatak and Tasugi-rigchah region. In table 2 have presented area and position of wind erosion crisis centers together with affected biotic and economic sources in Sistan plain. Total annual damage resulted from wind erosion crisis centers in Sistan plain are estimated 16815.683 million Rials. Table 2 showed areas and position of wind erosion crisis centers together affected biotic and economic sources and their preference and sources prone to damage.

CONCLUSION

Table 1 shows total area in Zabol that affected by wind erosion is over than 252453ha. Around 117058 ha of this area are belonging detachment region that from this region, 13203ha, 85967ha and 17888ha have high intensity (O_1), medium intensity (O_2) and low intensity (O_3) respectively. Transition region in this city is over than 86125ha that 34737ha of it has high intensity (T_1) and its remaining has low intensity (T_2). Deposition region in this city is 49270 ha area that 17913ha, 24107ha and 7250ha are active (S_1), semi active (S_2) and low active (S_3) respectively.

Niatak affected region by wind erosion

Niatak are located in east of Zabol city with an area of about 95920 ha. Study area is located in $61^\circ 13'$ to $61^\circ 48'$ E and $30^\circ 48'$ to $31^\circ 25'$ N. its detachment region is including: Hamoun lake bed in north of region, some of mobile sand cause of the movement of smuggler's cars in lake bed and Afghanistan country Niatak river bed, Bared local stream and agricultural land in the time of 120days storm in Sistan plain and recent years drought. Transport region is including river bed and it's around lands. Transport region has a low distance from deposit region that reached to border Joint River in end and so attacked many villages such as Jahangir, Mirzakhoun, ali Akbar Mollahosseini, jungle koud and etc. This range is located in 1:250000 maps scale with names Doust Mohammad khan and Zehak that have NH41-2 and NH41-6 numbers respectively.

From total affected area by wind erosion in Miankangi (Niatak), Around 48652 ha is located in detachment region (7500ha, 34843ha and 6318ha have high intensity (O_1), medium intensity (O_2) and low intensity (O_3) respectively). Transition region in this region is 34529ha that 6250ha of it has high intensity (T_1) and its remaining (28279) has low intensity (T_2). Deposition region in this region is 12739 ha area that 1405ha, 9227ha and 2107ha are active (S_1), semi active (S_2) and low active (S_3) respectively.

Jezink affected region by wind erosion

This region is beginning from 5km southwestern of Zabol city with an area of about 13905 ha. Study area is located in $61^\circ 29'$ to $61^\circ 44'$ E and $30^\circ 45'$ to $30^\circ 55'$ N. Beginning of detachment region is Nahrab river bed and after transition from Firouzei and Baghak village, some of sands deposition in behind of number1 Shib Aab channel and around land of Badil village and Ghale kang and remaining sands reached to Aliabad, Louf, Khaleghdad, Pelgipaein, Nime Chaharom and Khatam hole in end of points. The major of deflation region in this Erg is both agricultural land and remainder alluvial from flood of 1990 that involved high range around Firouzei, Baghak and number1 channel villages. This area is named Zehak and NH41-6 number on the topographic map with 1:250000 scale.

From total affected area by wind erosion in Jezink, 5703 ha is located in detachment region (total 5703ha has a high intensity (O_1)). Transition region is 5858ha that 3436ha of it has high intensity (T_1) and 2422ha has low intensity (T_2). Deposition region is equal to 2344 ha (1250ha is active and 1094ha is semi active).

Rigchah and Tasugi affected region by wind erosion

Tasugi-Rigchah is located in $60^\circ 44'$ to $61^\circ 16'$ E and $30^\circ 00'$ to $30^\circ 44'$ N with an area of about 142628 ha. This region is without residential district. This range is involving two region (Tasugi in 80km distance of Zabol southwestern in east of Shileh stream and Rigchah in 120km distance of Zabol center in west of Shileh stream) that are located in end of Sistan province in south. 120 days storm blown from northwest to southeast is cause to sand detachment from Hamoun Hirmand dry bed and around rangeland in drought time and lake outside in wet years. These sand dunes move from Zabol-Zahedan road to Iran-Afghanistan boundary and encompass 20km boundary road. Sand dune morphology is Barkhan and longitude dunes. This range is located in topographic map with 1:250000 scale by names Hamoun to number NH41-5. So mentioned this region is including two distinct section by names Tasugi and Rigchah that its south parts is located in Zahedan city from ministerial-politic aspect but all their area considered in Zabol city.

From total affected area by wind erosion in Tasugi-rigchah, 62703 ha are located in detachment region (51133ha and 11570ha have medium intensity (O_2) and low intensity (O_3) respectively). Transition region is 45738ha that 25051ha of it has high intensity (T_1) and 20687ha has low intensity (T_2). Deposition region is equal to 34187 ha (15258ha is active, 13786ha is semi active and 5134ha is low active or no active).

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REFERENCES

- [1]Desertification combating office. Identification of wind erosion critical centers and the practical prioritization, **1992**, 44p.
- [2]Desertification combating office. Desert combating in Sistan and balouchestan province, **2001**, Iran.
- [3]H. Ahmadi, Applied geo-morphology. Tehran university press. **1987**,592p.
- [4]H. Ahmadi. Applied geo-morphology. 2 ,**1997**, 570p.
- [5]H. Ahmadi, A. M. Tahmasebi Birgani, H. refahi, Ekhtesasi. Gh. *Iranian journal of Natural resources*, 10, **1997**, 32-41.
- [6]M. R. Ekhtesasi. Mapping wind erosion susceptible regions in Yazd using wind tunnel. M.Sc thesis, Natural resources department. Tehran University, **1992**, 237p.
- [7]M. R. Ekhtesasi. Originating sand dunes in Yazd-Ardakan plateau. The range and forest management organization of Iran, **1995**, 260p.
- [8]M. R. Ekhtesasi, H. Ahmadi. *Iraninan journal of natural resources*, 47,**1994**, 5-22.
- [9]Iranian center of management and planning statistics in Sistan and Balouchestan province,**1999**, 43p.
- [10]Terkarage. R, M. Sedighe, Pourkermani, M, Terrain forms in arid-lands. *Astane Ghods Razavi Org.* Press, **1999**, 633.
- [11]H. Gh. Refahi, Wind erosion and its control. Tehran University press. **1999**, 320p.
- [12]Iranian geographic center of the armed forces. Joint Action Mapp (topography) in scales of 1:250000 and 1:50000.
- [13]Iranian center of remote sensing. Digital imageries for **1998**, **1999** and **2000**.
- [14]Iranian Meteorological Center, Sistan and balouchestan Province, **2008**.
- [15]Tahmasebi Birgani. A. M, Different outputs of wind erosion and water erosion in SIAC, MP and IRIFR models, **2005**.