SINAI Journal of Applied Sciences 9 (2) 2020 169-182

Available online at www.sinjas.journals.ekb.eg

SCREENED BY iThenticate Professional Plagiarism Prevention

SINAI Journal of Applied Sciences

Print ISSN 2314-6079
Online ISSN 2682-3527

ARU-EGYPT SJAS Trust Science | It Creates

ASSESSMENTS OF ENVIRONMENTAL SENSITIVITY TO DESERTIFICATION IN BER EL-ABD AREA, NORTH SINAI, EGYPT USING MEDALUS MODEL

Hend H. Abd El-Hameed[1*], E.R. Marzouk[1], M. R. Abdo[1] and A.B. Abdelmontaleb[2]

1. Dept. Soil and Water, Fac. Environ. Agric. Sci., Arish Univ., Egypt.

2. Dept. Soil, National Authority for Remote Sensing and Space Sci., Cairo, Egypt.

ARTICLE INFO

Article history:
Received: 16/07/2020
Revised: 15/09/2020
Accepted: 15/09/2020
Available online: 15/09/2020

Keywords:
North Sinai,
GIS, Remote sensing,
Desertification sensitivity,
MEDALUS.

Check for updates

ABSTRACT

North Sinai, desertification risk is one of the main environmental and also social and economic problems. This study aims to use geospatial information to assess the environmental sensitivity for desertification in Ber El-Abd area, North Sinai, Egypt. Based on the Mediterranean Desertification and Land Use (MEDALUS) approach and the characteristics of the study area. This model could provide a valuable quantitative assessment of environmental sensitivity to desertification. It also could support decision makers with important information that could help in protecting and sustaining natural resources. Five main indicators of desertification including soil (soil depth, soil texture, electrical conductivity, rock fragments, drainage, and calcium carbonate), climate (rainfall, evapotranspiration, and aridity index), vegetation (erosion protection, drought resistance, and plant cover), erosion (wind erosion, water erosion) and management (land use, grazing intensity as well as policy and management) were considered for estimating the environmental sensitivity to desertification. Arc-GIS 10.4.1 and ENVI 5.4 software were used for assessing the desertification sensitive index, of which the map of environmentally areas of Ber El-Abd are, North Sinai Peninsula is produced. The obtained data reveals that 47.9% of Ber El-Abd area is characterized by very sensitive areas to desertification, sensitive areas about 1.1%, while the low sensitive areas only 6%. The moderately sensitive areas occupies approximately 4.8% of the study area.

INTRODUCTION

Desertification is defined as “a condition of human-induced land degradation that occurs in arid, semi-arid and dry-sub humid regions and leads to a persistent decline in economic productivity of useful biota related to a land use or production system” **(UNCCD, 2002)**. The United Nations Conference on desertification defined it as the diminution or destruction of the biological potential of the land, which could lead ultimately to the formation of desert-like conditions. This definition was modified by the United Nations Environment Programed (UNEP) as land degradation in arid, semi-arid and dry sub-humid areas resulting mainly from adverse human impact (**Shalaby *et al.*, 2004**). The climatological conditions of the northern part of Sinai play an important role in shaping North Sinai area and in controlling the ecology of the area. These conditions include extreme aridity, long hot rainless summer periods and mild winters in which storms rarely occur. The northern part of Sinai is also characterized by a so called El-Khamasin storms or sandstorms. These are violent winds which blow intermittently over a period of 50 days during February and March. Generally, the prevailing climatic conditions in the North Sinai

* **Corresponding author: E-mail address:** hend_hh2009@yahoo.com
https://doi.org/10.21608/SINJAS.2020.36002.1001

include low rainfall, high temperatures, strong wind, high evaporation and low relative humidity.

The temperatures in the North Sinai differ from one location to another according to its position from the Mediterranean Sea and the direction of winds **(Hassan, 2002)**. **Breckle *et al.* (2**

001) and Elnaggar (2014) show that desertification is one of the most important problems that are facing arid and semi-arid regions along the world. This phenomenon could be either human-induced or due to adverse natural conditions or both, which is common. Egypt is classified as territory susceptible to very high to high desertification sensitivity. The desertification processes existing in Egypt include; urban encroachment on expenses of arable land, wind erosion, water erosion, salinization and water logging (**Rasmy *et al.*, 2010**). **Saleh *et al.* (2018)** reported that different models have been recently developed for the quantitative assessment of desertification. The Mediterranean Desertification and Land Use (MEDALUS) model is one of the most commonly used models in this regard **(Basso *et al.*, 2000; Kosmas *et al.*, 2003)**. Different types of sensitivity to desertification were observed around the Mediterranean region. Most of highly sensitive areas in that region were primarily associated with low rainfall, low vegetation cover, low resistance of vegetation to drought, steepness and high soil erosion **(Ali and El-Baroudy, 2008; Gad and Lotfy, 2008; Afifi *et al.*, 2010)**. This model considers soil, vegetation, climate and management quality indices in the evaluation of Environmental Sensitivity Areas (ESAs) to desertification. It could be concluded that the Mediterranean Desertification and Land Use (MEDALUS) model could provide a valuable quantitative assessment of environmental sensitivity to desertification. It also could support decision makers with important information that could help in protecting and sustaining natural resources. In this model environmental sensitivity to desertification was evaluated based on four important quality indices (soil, vegetation, climate and management) that have great impact on that phenomenon. Remote sensing and GIS techniques are very helpful to collect, store, manage, retrieve, analyze, and output the huge amounts of geospatial data and field observations (**Al-Khuzaie *et al.*, 2015**). The development of GIS facilitated the integration of multi sources of spatial data, which helped in the establishment and standardization of procedures used to evaluate and identify sensitive areas to desertification **(Ferrara *et al.*, 1995; Basso *et al.*, 1998)**.

The aim of this study was to use MEDALUS methodology using GIS to assess and map the desertification sensitivity in Ber El-Abd area, North Sinai, depending upon the soil's characteristics, climaticdata, vegetation, erosion and management practice.

MATERIALS AND METHODS

Study Area

The studied area is located at the northern part of the Sinai Peninsula, bounded by longitudes 33^{o} 15` and 32$^{o}$ 45` East, and latitudes 30^{o} 55` and 31$^{o}$ 15` North, as shown in Fig. 1. The main geomorphological units in North Sinai are basin, sabkhas (dry and wet), sand dunes (high, medium and low), man-made terraces, sand sheet, salts, swamps, lake, island, sand bare, water bodies, and costal sand dunes (Fig. 2). Soils of North Sinai were classified into two orders: Aridisols and Entisols **(Hassan, 2002)**. The studied area has typically arid and semi-arid climatic conditions **(Mohamed, 2013).** The maximum temperature is 31.9°C in Ber El-Abd station, as was recorded in August, while the minimum temperature is 18.5°C, as was recorded in January. The mean temperature in winter ranges between 14.7°C to 16.6°C and 14.2°C to 16.1°C. In summer, the mean temperature ranges between 24.4 to 24.7°C. The soil temperature regime of the area could be

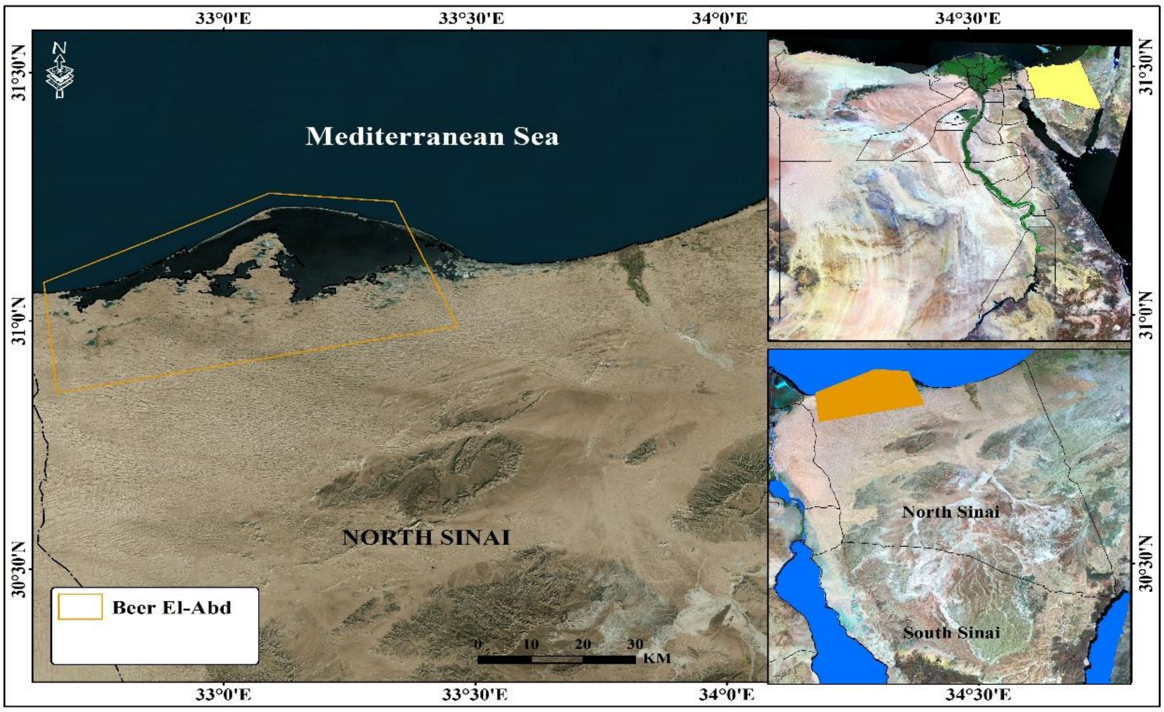

Fig. 1. Location of the study area

defined as thermic and the soil moisture regime as torric, except for the soil that has a high-water table where the soil moisture regime could be considered as aquic. The natural vegetation in the studied area is very poor, and the most striking feature in the area is its barrenness. El Salam canal is considered one of the main sources of irrigation water; it feeds the northern part of the investigated area. The source of this water is Nile water, Bahr Hadous and Serw drains, with a mixing ratio of 1:1 **(Mohamed, 2006)**.

Digital **Image Processing**

The studied area was represented by Landsat 8 satellite images dated from 2018. The images were atmospherically corrected to calculate (Normalized Difference Vegetation Index) NDVI by equation (NDVI=(NIR–RED)/(NIR +RED) to assess the vegetation quality index. A mosaic process was elaborated to overlay the images. (Shuttle Radar Topography Mission) SRTM Digital Elevation Model (DEM) images were used as the source data for the elevation heights of the study. DEM has been derived from SRTM images. Slope and aspect were derived from DEM as a factor of soil quality index. The mosaic image was draped over DEM to get the feel of a natural 3D theme to get a better understanding of the physiographic units and to facilitate extracting these units.

Soil Data Collection

Around 39 soil profiles were collected, 26 soil profiles from **Ragab and Reda, (2005)** report and 13 soil profile from **Hola, (2000)**. M.Sc. Thesis.

Spatial assessment for desertification sensitive index (DSI)

GIS was used five thematic indicators quantifying the environmental quality in terms of climate, soil, vegetation, land management, and erosion **(Sepehr *et al.*, 2007; Mohamed, 2013),** (Table 1).

$$DSI = (SQI \times VQI \times CQI \times MQI \times EQI)^{1/5}$$

Where DSI is the desertification quality index, SQI is the soil quality index, VQI is the vegetation quality index, CQI is climate quality index, MQI is the management quality index, and EQI is the erosion quality index.

Soil quality index (SQI)

The following equation was used to assessment soil quality index

$$SQI = (Id \times It \times Is \times Ic \times Ie \times Ir \times Idr)^{1/7}$$

Where Id is the index of soil depth, It is the index of soil texture, Is is the index of slope gradient, Ic is the index of calcium carbonate content, Ie is the index of Electrical conductivity, Ir is the index of rock fragment and Idr is the index of drainage condition.

Climate quality index (CQI)

Climate quality is calculated according to the following equation:

$$CQI = (Ir \times Ie \times Ia)^{1/3}$$

Where Ir is the index of rainfall, Ie index of evapotranspiration, and Ia is the index of aridity.

Vegetation quality index (VQI)

Vegetation quality index was calculated according the following equation:

$$VQI = (Iep \times Idr \times Ipc)^{1/3}$$

Where Iep is the index of erosion protection, Idr is the index of drought resistance, and Ipc is the index of plant cover.

Management quality index (MQI)

Management quality index was calculated according to the following equation:

$$MQI = (Il \times Ip \times Ig)^{1/3}$$

Where Il is the index of land use, Ig is the index of grazing intensity, and Ip is the index of policy.

Erosion quality index (EQI)

Erosion Quality Index was calculated on the basis of the following equation:

$$EQI = (\text{Wind erosion} \times \text{Water erosion})^{1/2}$$

RESULTS AND DISCUSSION

Soil Quality Index

The soil quality can be evaluated by using simple soil properties such as soil texture, electrical conductivity, rock fragment cover, soil depth, slope grade, drainage conditions as well as calcium carbonate contents. The results indicate that the classes of soil quality index were high- and low-quality soils (Table 2), 57.6% (1315.8 km^2) of the studied area is characterized by high soil quality, the low soil quality index occupies an area about 2.2 % (49.7 km^2) of the total area as shown in Fig. 3 and Table 2.

Climate Quality Index

The rainfall, evaporation, and aridity are the main climatic attributes which contributes to the desertification processes. The result illustrated, the climate quality index was fitted under one category, which is semi-arid (about 59.8%) (Table 3 and Fig. 4). Climate quality has influence on the vulnerability of soils to desertification due to its critical impact on the growing of vegetation and soil erosion.

Vegetation quality index

Vegetation quality index is an essential factor for assessing the degree of desertification sensitivity in north Sinai. The erosion protection to the soils, drought resistance, and plant cover are the major factors affecting vegetation quality in the studied area. Remotely sensed images were used to derive NDVI as a good indicator of vegetation cover. The overall vegetation quality index of the study area was fitted into two categories (Table 5). These categories are moderately quality in about 4.7% and very low quality in about 55.1% of the study area as illustrated in Fig. 5 and Table 4.

Table 1. Classes and factors assigned weighting index affecting desertification process

Indicator	Sub indicator	Description	Class (threshold)	Index
Soil quality index	Soil depth	Very deep	Depth >1 m	1.0
		Moderately deep	Depth <1 to 0.5 m	1.33
		Shallow	Depth <0.5 to 0.25 m	1.66
		Very shallow	Depth <0.15 m	2.00
	Soil texture	Loamy sand, Sandy loam	1	1.0
		Loamy clay, clayey sand, sandy clay	2	1.2
		Clayey, clay loam	3	1.6
		Sandy to very sandy	4	2.0
	Slope gradient	Gentle	<6 %	1.0
		Not very gentle	6–18 %	1.33
		Abrupt	19–35 %	1.66
		Very abrupt	>35 %	2.0
	Electrical conductivity	Very low	<4 dS/m	1.0
		Low	4–8	1.2
		Moderately	8–16	1.5
		Moderately high	16–32	1.7
		High	>32	2.0
	Rock fragments	Very stony	>60 %	1.0
		Stony	60–20 %	1.3
		Bare to slightly stony	<20 %	2.0
	Drainage	Well drained	1	1.0
		Moderately drained	2	1.2
		Poorly drained	3	2.0
	Calcium carbonate	Non-calcareous	<5 %	1.0
		Slightly calcareous	5-10%	1.2
		Moderately calcareous	10-20%	1.5
		Strongly calcareous	>20%	2.0
Climate quality index	Rainfall (mm)	High	>300 mm	1.0
		Moderately	150–300 mm	1.33
		Low	>150 mm	1.66
	Evapotranspiration (mm) Calculated according (FAO Penman-Monteith method)	Low	<1,500 mm	1.0
		Moderately	1,500–2,000 mm	1.5
		High	>200 mm	2.0
	Aridity index (P/ETp)	Semi-arid	AI≥1	1.0
		Arid	AI 0.1–1	1.5
		Hyper-arid	AI <0.1	2.0

Table 1. Cont.

Indicator	Sub indicator	Description	Class (threshold)	Index
Management quality index	Land use	Agricultural lands	1	1
		Rangelands	2	1.3
		Poor and degraded	3	1.6
		Bare lands	4	2
	Grazing intensity	Low	<1	1.0
		Moderate	1–2.5	1.5
		High	>2.5	2
	Policy and management	Complete: >75% of the area under protection	1	1.0
		Partial: 25–75% of the area under protection	2	1.5
		Incomplete: <25% of the area under protection	3	2.0
Erosion quality index	Wind erosion	Very low	1	1
		Low	2	1.2
		Moderate	3	1.5
		High	4	1.7
		Very high	5	2
	Water erosion	Very low	1	1
		Low	2	1.2
		Moderate	3	1.5
		High	4	1.7
		Very high	5	2
Vegetation quality index	Erosion protection	High	1	1.0
		Moderately	2	1.33
		Low	3	1.66
		Very low	4	2
	Drought resistance	Gardens, orchards, rangelands	1	1.0
		Permanent grassland, annual crops and grasslands	2	1.5
		Bare land	3	2.0
	Plant cover	High	>35%	1.0
		Low	10-35%	1.5
		Very low	<10%	2

Table 2. Soil quality index of the studied area

SQI classes	Score	Area (Km^2)	Area (Fed)	Area (ha)	Area of total (%)
High quality	<1.2	1315.8	315190.1	750468	57.6
Low quality	>1.5	49.7	11839.7	28190	2.2
Reference terms		916.8	216371.2	515180	40.2
Total		2282.3	543401.0	1293838	100

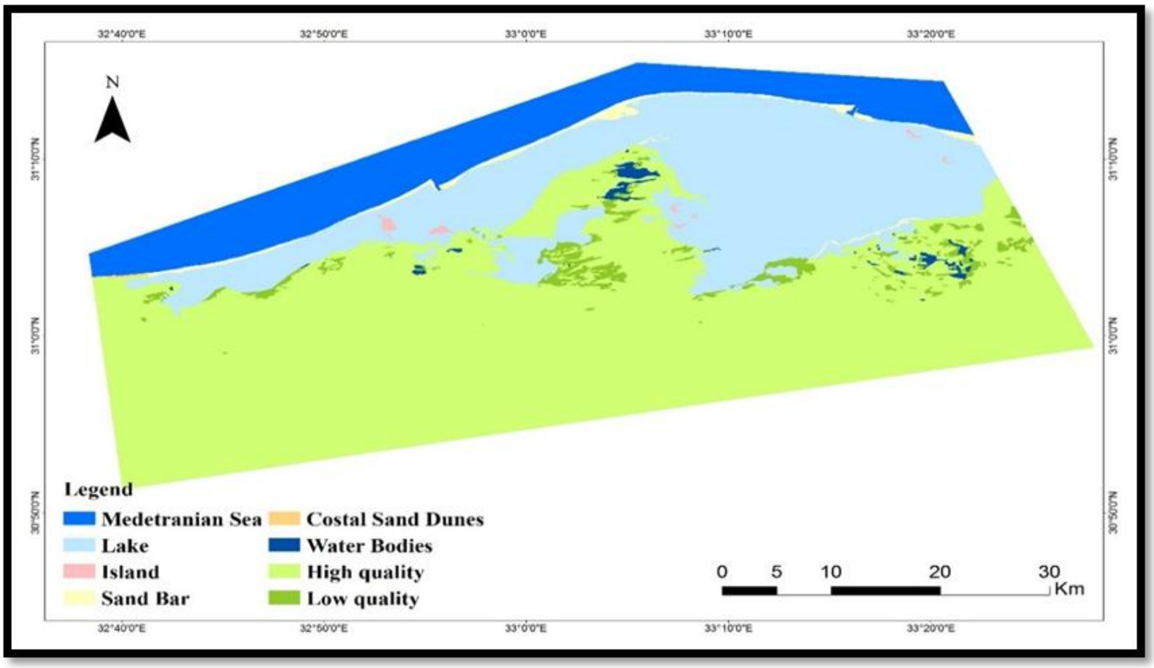

Fig. 3. Classes of Soil quality index in the studied area

Table 3. Climate quality classes of the studied area

CQI classes	Score	Area (Km^2)	Area (Fed)	Area (ha)	Area of total (%)
Semi-arid	1.2-1.4	1365.5	327029.8	778658	59.8
Arid	1.4-1.6	-	-	-	-
Hyper-arid	>1.6	-	-	-	-
Reference terms		916.8	216371.0	515179	40.2
Total		2282.2	543401.0	1293838	100

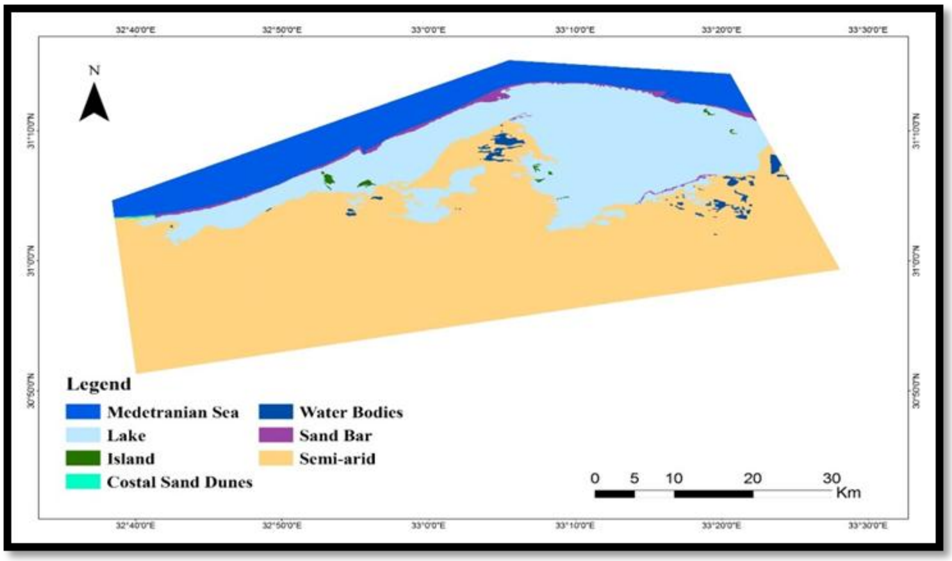

Fig. 4. Classes of Climate quality index classes of the studied area.

Table 4. Vegetation quality classes in the studied area

VQI classes	Score	Area (Km^2)	Area (Fed)	Area (ha)	Area of total (%)
High quality	<1.2	0	0	0	0
Moderate quality	1.2-1.4	107.8	26165.9	62301	4.7
Low quality	1.4-1.6	0	0	0	0
Very low quality	>1.6	1257.7	299457.7	713009	55.1
Reference terms		916.8	217777.4	518528	40.2
Total		2282.3	543401.0	1293838	100

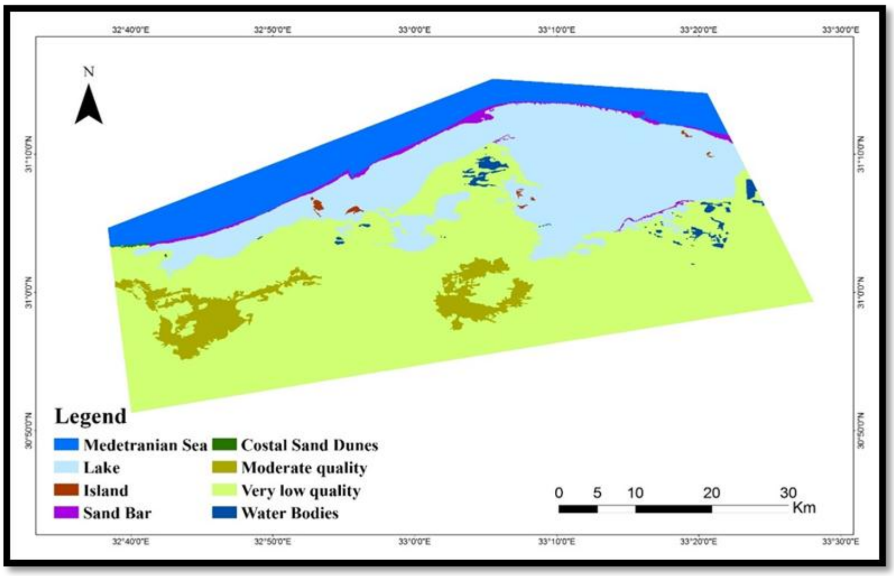

Fig. 5. Vegetation quality index classes of the studied area

Table 5. Management quality classes in the studied area

MQI classes	Score	Area (Km^2)	Area (Fed)	Area (ha)	Area of total (%)
High quality	1.0-1.3	310.7	73986.6	176162	13.6
Moderate quality	1.3-1.5	688.0	163816.6	390047	30.1
Low quality	>1.5	366.7	87300.9	207863	16.1
Reference terms		916.8	218296.8	519765	40.2
Total		2282.3	543401.0	1293838	100

Management Quality Index

Management quality index included land use, grazing intensity, and policy, which were clearly important factors controlling the desertification process. The result indicated that the management quality index of the study area was fit into three categories as demonstrated in Table 5. These categories are high, moderate and low in about 13.6, 30.1 and 16.1% of the studied area, respectively (Table 5 and Fig. 6).

Erosion Quality Index

Erosion plays an important role in desertification sensitivity in the northern Sinai region, which is characterized by a high and moderate erosion quality index due to the effect of morphology and relief, wind velocity, soil characteristics, and plant cover. The result indicated that the overall erosion quality index of the study area was fitted into three categories (Table 6). These categories are high, moderate and low quality in about 11.3, 39.8 and 8.9% respectively from the study area as illustrated in Fig. 7 and Table 6.

Desertification Sensitive Index (DSI) in the Studied Area

The integration of soil parameters, climate condition, vegetation cover, management, and erosion rates were considered to derive DSI. Based on the results of the above-mentioned quality indices, SQI, CQI, VQI, MQI and EQI in the study area were fitted into four environmental sensitivity classes to desertification. These classes are very sensitive areas (represent about 47.9% of the study area), sensitive areas (represent about 1.1% of the study area), moderate sensitive areas (represent about 4.8% of the study area) and low Sensitive areas (represent about 6% of the study area), as illustrated in Fig. 8 and Table 7.

Conclusions

The MEDALUS model is very valuable method in assessing the desertification phenomena in arid and semi-arid regions. In this study, we apply the MEDALUS methodology using GIS to assess and map the desertification sensitivity in the study area depending upon the soil's characteristics, climatically data, erosion, vegetation, and management practice. Remote sensing data and GIS tools is very important in identifying areas where sensitivity is increasing over time. This work covered the highlights and overviews on severity areas in the Ber El-Abd, North Sinai where it shows a part, about 47.9 %, of the studied area which is susceptible to desertification due to low vegetation cover, soil quality, mismanagement, climate condition, and wind erosion. Therefore, these area of North Sinai needs great efforts from the Egyptian government to overcome these phenomena through using effective management and policies to combat desertification.

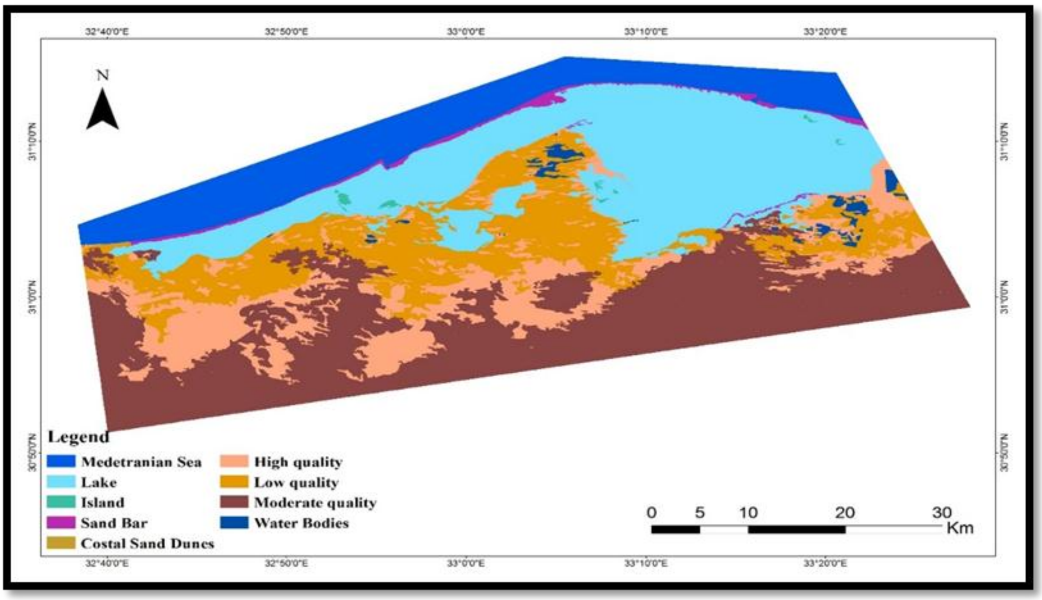

Fig. 6. Management quality index classes of the studied area

Table 6. Erosion quality classes in the studied area

EQI classes	Score	Area (Km^2)	Area (Fed)	Area (ha)	Area of total (%)
Low quality	<1.2	202.4	48199.9	114764	8.9
Moderate quality	1.2-1.6	904.5	215362.3	512778	39.6
High quality	>1.6	258.5	61541.9	146531	11.3
Reference terms		916.8	218296.8	519765	40.2
Total		2282.3	543401.0	1293838	100

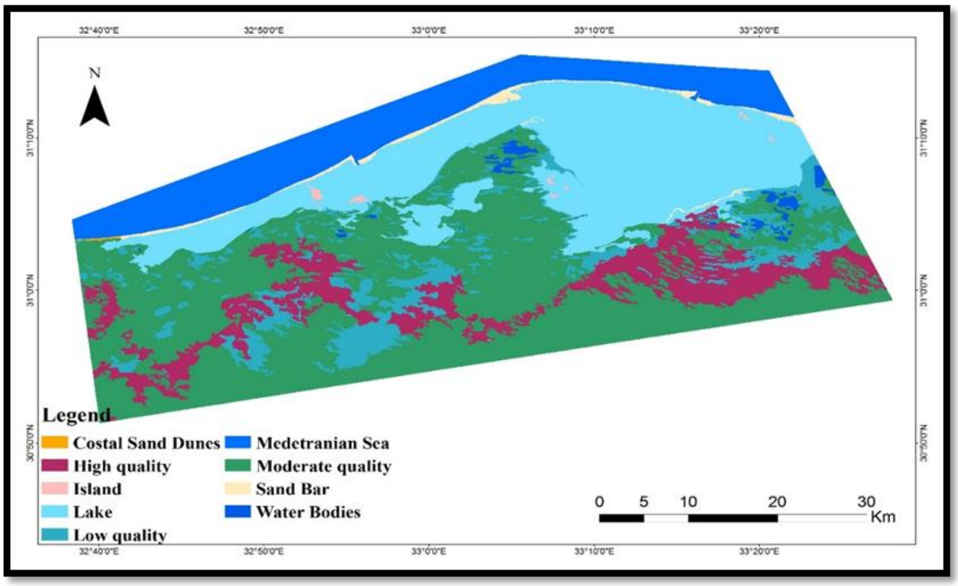

Fig. 7. EQI classes of the studied area

Table 7. Environmentally sensitive areas

DSI class	Score	Area (Km^2)	Area (Fed)	Area (ha)	Area of total (%)
Low sensitive areas	1.2-1.3	137.4	32702.5	77865	6.0
Moderately sensitive areas	1.3-1.4	109.9	26165.9	62301	4.8
Sensitive areas	1.4-1.6	25.8	6134.4	14606	1.1
Very sensitive areas	>1.6	1092.5	260114.1	619332	47.9
Reference term		916.8	218284.1	519734	40.2
Total		2282.3	543401.0	1293838	100

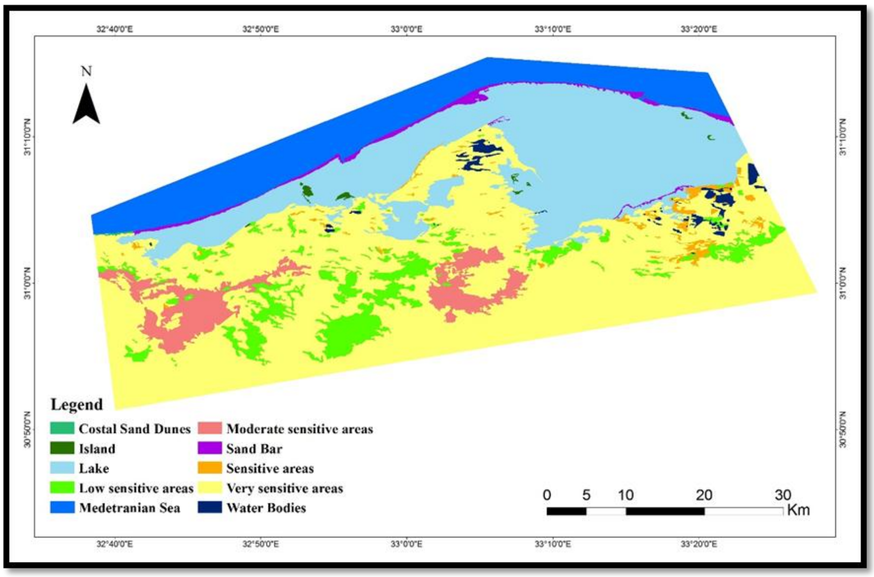

Fig. 8. DSI map of study area

REFERENCES

Afifi, A.; Gad, A. and Refat, A. (2010). Use of GIS and remote sensing for environmental sensitivity assessment of North coastal part, Egypt. J. Ame. Sci., 6 (11): 632-646.

Ali, R.R. and El-Baroudy, A.A. (2008). Use of GIS in mapping the environmental sensitivity to desertification in Wadi El Natrun Depression, Egypt. Aust. J Basic and Appl. Sci., 2(1): 157-164.

Al-Khuzaie, M.M.; Elnaggar, A.A., Mowafy, M. and El Sheikha, Z.M. (2015). Assessments of Environmental Sensitivity to Desertification in North Sinai, Egypt Using Remote Sensing and GIS Techniques. Int. J. Sci. and Eng. Res., 6 (7). ISSN 2229-5518.

Basso F., Bove E., Dumontet S., Ferrara A., Pisante M., Quaranta G., and Taberner M. (2000): Evaluating environmental sensitivity at the basin scale through the use of Geographic Information Systems and remote sensed data. An Example Covering the Agri Basin (Southern Italy). Catena 40:19–35.

Basso, F.; Bellotti, A.; Bove, E.S. Faretta, A.; Ferrara, G.; Mancino, M.; Pisante, G.Quaranta, and Taberner, M. (1998): Degradation processes in the Agri Basin: evaluating environmental sensitivity to desertification at basin scale. Proceedings International Seminar on 'Indicator for Assessing Desertification in the Mediterranean'. Porto Torres, Italy 18 – 20 September. Edited by G. Enne, M. D'Angelo, C. Zanolla. Supported by ANPA via Brancati 48 - 00144 Roma. pp 131-145.

Breckle, S.W.; Veste, M., and Wucherer, W., (2001): Sustainable Land Use in Deserts. Springer-Verlag Berlin · Heidelberg Germany. **eBook ISBN:** 978-3-642-59560-8.

Elnaggar, A. A. (2014): Environmental Sensitivity to Desertification in Bahariya Oasis, Egypt. 11 th Int. Conf. of the Egyptian Soc. (ESSSJ), Fac. of Agric., Kafer El-Sheikh Univ., Egypt.

Ferrara, A., M. Pisante, A. R. Harrison and M. Taberner, (1995): The use of spatial relationship analysis to study the Agri-basin with remotely sensed images. MEDALUS II Final Report, King's College, London, pp.67–83.

Gad, A., and Lotfy, I. (2008): Use of remote sensing and GIS in mapping the environmental sensitivity areas for desertification of Egyptian territory. Earth Discussions, 3(2), 41-85.

H. and Sh, N. (2000). Land use Mapping for Selected areas of El-Salam Canal Command- Sinai, using remote sensing and GIS. M.Sc., Thesis Fac. Agric., Cairo Univ., Egypt.

Hassan, M.A., (2002): Environmental studies on coastal zone soils of the north Sinai Peninsula (Egypt) using remote sensing techniques. Ph.D. Soil and Water Dept., Fac. of Agri., SCU, Ismailia, Egypt.

Kosmas, C.; Ferrara, A.; Briasouli, H. and Imeson, A. (2003). Methodology for mapping environmentally sensitive areas (ESAs) to desertification. Mediterranean Desertification and Land Use (MEDALUS), Europ. Union 18882, 31–47 ISBN 92-828-6349-2

Mohamed, E.S. (2006). Optimum land use planning for some newly reclaimed soils in west of Suez Canal area using remote sensing techniques. M.Sc. Thesis, Univ., Egypt.

Mohamed, E.S. (2013). Spatial assessment of desertification in north Sinai using modified MEDLAUS model. Arab J Geosci., 6:4647–4659 DOI 10.1007/ s12517-012-0723-2.

Ragab, M. and Reda, M. (2005). Maximizing of land water suitability in Bir El Abd region El-Salam Canal basin. Final report (phase I) Sand Dunes Encroachment, Suez Canal Univ.

Rasmy, M.; Gad, A.; Abdelsalam, H. and Siwailam, M. (2010). A dynamic simulation model of desertification in Egypt. Egypt. J. Remote Sensing and Space Sci., 13: 101–111.

Saleh, A.M.; Belal, A.A. and Jalhoum, M. (2018). Quantitative Assessment of Environmental Sensitivity to Desertification in Sidi Abdel-Rahman area, Northern West Coast Egypt. Egypt. J. Soil Sci., 58 (1): 13 -26.

Sepehr, A.; Hassanli, A.M.; Ekhtesasi, M.R. and Jamali, J.B. (2007). Quantitative assessment of desertification in south of Iran using MEDALUS method. Environ Monit. Assess., 134: 243–254.

Shalaby, A.; Aboel Ghar, M. and Tateishi, R. (2004). Desertification Impact Assessment in Egypt Using Low Resolution Satellite Data and GIS. Intern. J. Environ. Studies, 61 (4): 375–383.

UNCCD (2002). United Nations Convention to Combat Desertification in those countries experiencing serious drought and/or desertification, particularly in Africa. Text with annexes. Secretariat of the UNCCD, Bonn, 76.

الملخص العربي

تقييم الحساسية البيئية للتصحر في منطقة بئر العبد، شمال سيناء، مصر باستخدام نموذج ميدلس

هند حسين عبد الحميد[1]، عزت رشاد مرزوق[1]، محمد رجب عبده[1]و عبد العزيز بلال عبد المنطلب[2]

1- قسم الأراضي والمياه، كلية العلوم الزراعية البيئية، جامعة العريش، مصر.

2- قسم علوم الأراضي، الهيئة القومية للاستشعار عن بعد وعلوم الفضاء، القاهرة، مصر.

تعتبر مخاطر التصحر في شمال سيناء من أهم المشاكل البيئية والاجتماعية والاقتصادية، تهدف هذه الدراسة إلى استخدام المعلومات الجغرافية المكانية لتقييم الحساسية البيئية للتصحر في منطقة بئر العبد، شمال سيناء، مصر، بناءً على نموذج البحر المتوسط للتصحر واستخدام الأراضي (ميدلس) وخصائص منطقة الدراسة، يمكن أن يوفر هذا النموذج تقييماً كمياً قيماً للحساسية البيئية للتصحر، كما يمكن أن يدعم صناع القرار بمعلومات مهمة يمكن أن تساعد في حماية واستدامة الموارد الطبيعية. خمسة مؤشرات رئيسية للتصحر تم استخدامها تشمل التربة (عمق التربة، قوام التربة، الموصلية الكهربائية، شظايا الصخور، الصرف، كربونات الكالسيوم)، المناخ (هطول الأمطار، التبخر، مؤشر الجفاف)، الغطاء النباتي (الحماية من التآكل، مقاومة الجفاف، الغطاء النباتي)، التعرية (تعرية الرياح، تعرية المياه) والادارة (استخدام الأراضي، كثافة الرعي، السياسة والإدارة) لتقدير الحساسية البيئية للتصحر، تم استخدام برامج Arc-GIS 10.4.1 و ENVI 5.4 لتقييم مؤشر حساسية التصحر، و إنتاج خريطة مناطق الحساسية البيئية للتصحر بمنطقة بئر العبد - شمال سيناء، تشير البيانات التي تم الحصول عليها إلى أن 47.9% من منطقة بئر العبد - تتميز بمناطق حساسة للغاية للتصحر، ومناطق حساسة حوالي 1.1%، في حين أن المناطق منخفضة الحساسية فقط 6%. تحتل المناطق ذات الحساسية المتوسطة حوالي 4.8% من مساحة الدراسة.

الكلمات الاسترشادية: شمال سيناء، نظم المعلومات الجغرافية، الاستشعار عن بعد، حساسية التصحر، ميدلس.

المحكمـــــــون:

1- أ.د. مصطفى على حسن أستاذ الأراضي والمياه المتفرغ، كلية العلوم الزراعية البيئية، جامعة العريش، مصر.

2- أ.د. أيمـــن محمد حلمي أستاذ الأراضي والمياه، كلية الزراعة، جامعة الزقازيق، مصر.