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Research Article

The quantity and quality of ground water and wind erosion by FAO and UNEP in desertification Shor River Basin in Tehran province

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ABSTRACT:
Desertification is one of the processes that is accelerating and increasing in the trans-regional scale, reducing the efficiency of the territories and increasing the quality and quantity of environmental pollution. The FAO, at the United Nations Conference on Combating Desertification, proposed a methodology based on which small-scale desertification plans were developed and developed. In this paper, wind erosion quantity and quality of groundwater decline in the Salt River area has been studied only in Tehran province. The first method is based on evaluating the resources and capabilities terrain map units specified in Tehran. Then, while reviewing existing studies and field visits to evaluate the state of desertification in the three modes. A) classification wind erosion status of groundwater in terms of quantity and quality of existing Status: Where factors such as water and wind erosion and geomorphological evidences and washed the soil at ground leveland it is examined groundwater levels and quality.(B) the assessment and classification of wind erosion quantity and quality of groundwater decline in terms of speedand the percentage of degradation and deterioration quantity and quality of groundwater in a 26-year period examined. C-assessment and classification of natural talent factors: At this stage, we review the natural potential and slope area of soil texture and depth of the aquifers studied. In the end, after weighing the any of the above factors modulator data in GIS the role of each factor as determined in the study area map. The maps also shed light on the role of each factor in desertification, practical information at the disposal of the planners.

Keywords: Desertification, FAO and UNEP, Salt Lake basin, wind erosion, loss of quality and quantity of groundwater

1-INTRODUCTION

The phenomenon of desertification is the reduction of ecological and biological power of the earth, which occurs naturally and artificially. This phenomenon is considered as the third most important global challenge in the 21st century after two challenges of climate change and freshwater scarcity. (Ekhtesasi and Mohajeri (1995). Desert criteria include: climate, geology, geomorphology, soil health, ecology and vegetation. (Nateghei. 2000:232). Some 1035 million hectares of the world's susceptible drylands are affected by land degradation, of which about 90 percent are in the light to moderate categories (as defined by the UN). At the world scale, dryland degradation is dominated by water erosion (48%) and wind erosion (39%). Chemical deterioration accounts for just 4%. The situation varies according to bioclimatic zone. Wind erosion is a major cause (60%) in the arid regions while it accounts for only 21% in the dry humid regions (Victor et al.,2011). Wangati (1997) by considering the indicators effective in land degradation prepared the risk map of different regions of Kenya using FAO/UNEP.

They stated that the desertification of 1%, 13%, 53%, and 33% of the territory was very severe, severe, moderate and slight, respectively. Harasheh and Tateshi (2000) prepared the desertification map in West Asia using FAO/UNEP Vegetation degradation, water and wind erosion, and soil salinity were detected as the most important factors of desertification.(Ladisa. 2002), in assessing the desertification of Bari region in Italy, investigated six indicators including soil, vegetation, land use, management and human pressures and provided the final map of desertification using the geometric mean of indicators.

Ahmadi (1995) just considered three criteria important in the development and formation of deserts including climate, geology and vegetation-ecology, Akbari (2011:399) The most important reason for desertification is the reduction of canopy cover, vegetation decline and severe erosion,Kardavani introduced climate as the sole distinctive feature in desert formation. However, any single-dimensional view to this phenomenon has been rejected explicitly by Servati (1995). Based on the results obtained in the Meyghan Desert catchment area in Iran, 125853 hectares (23%) of the land in the small class, 251504 hectares (45%) in the middle class and 158819 hectares (29%) in the severe desertification class are located. Extreme desertification is mainly observed in mountain rangelands and areas with a gradient of over 60% that have poor vegetation and are found in saline and dry lands of the margin of the Meyghan Desert. Vegetation deterioration and water erosion are among the main causes of desertification in this area and grazing pressure is the main cause of desertification intensification (Farmahini& Darvish,2013).

2-MATERIALS AND METHODS

Desertification is one of the main driver of global famine and intensive urbanization. Fertile soil that passes the process of desertification cannot be reversed and it is lost for many decades. Basically the process is the degradation of soil. Soil degradation is not necessarily continuous. It may take place over a relatively short period between two states of ecological equilibrium. The processes of soil degradation are mainly water erosion, wind erosion, salinization and/or codification, chemical degradation, physical degradation, and biological degradation. The concept of DPSIR (driver, state, impact, and response) has been adopted by the European Environment Agency and other organizations for soil strategy. For example, in this model: *state indicators* are soil water availability, land suitability, erosion vulnerability, etc.; *pressure indicators* are human and environmental harmful effects, such as deforestation, ground water overexploitation, forest fire, etc.; *response indicators* are represented by corrective measures, such as sustainable farming, ground water recharge, terracing, storage of runoff water, etc.; *driving forces indicators* represent human activities that impact land degradation, such as intensified agriculture, overgrazing, uncontrolled tourism, and population increase; and finally *impact indicators* of the desertification process, e.g., loss of plant productivity and farm income, flooding of low land, dam sedimentation, etc. (Robert H. Armon2014:235).

Consequently, a provisional methodology for assessment and mapping of desertification was formulated (FAO/UNEP, 1984). The reason is related to the extent of the four processes as well as their more effective role in reducing land productivity. In addition to the seven natural processes mentioned above, two other processes are presented in the method with human origin including livestock and population pressure on the environment. The above processes are evaluated from three aspects of current status, inherent risk and speed. In this paper, the vegetation degradation process is investigated from the aspect of current status and inherent risk. In addition to FAO/UNEP, many scientists and researchers have suggested several methods for

qualitative and quantitative assessment of the desert. Contrary to FAO/UNEP, highlighting the role of human pressure in the assessment of land desertification processes. In a study carried out in the form of a design study in 1999, Darvish, a researcher at the Desert Division of the Forestry and Forestry Research Institute, concluded That's about 60% of the area of Iran can implement this approach on a larger scale. The initial compilation of this methodology was carried out by specialists from UNEP, FAO and the International Association of Soil Sciences. More than 1/3 of the land in the world has a dry climate, and the phenomenon of desertification has intensified in these areas, especially in recent decades. This method in Iran can also be useful for government executives and planners in terms of dry belt(Darvish 1999).

3-RESULTS AND DISCUSSION

- ***Quantitative and qualitative drop in water resources*:**

The quality and quantity of water resources can be considered as one of the most important indicators of desertification Considering the characteristics of Iran, this process is considered as one of the important processes of desertification assessment. In terms of current status and speed, the quality and quantity of water resources are examined as follows

-From the perspective of the current situation

To assess the current situation, four main indicators have been identified:

Electric conductivity of groundwater in working units currently in milliseconds per cm; The ratio of sodium absorption of groundwater presently; The annual static depth reduction (centimeters); and the number of fish with a water depth of less than 300 centimeters compared to the pre-survey period. And the number of fish with a water depth of less than 300 centimeters compared to the pre-survey period. These 4 indicators are ranked and classified according to Table1.

Table 1 - The method of evaluation and classification of groundwater resources from the perspective of the current situation.

Degree and desertification weight ---------- **Evaluation Indicators**	**Insignificant** (2.5)	**Average (5)**	**Intense** (4.5)	**Very intense (10)**
The amount of electrical conductivity of irrigation water or underground water (mcm / cm)	**.75≤**	**2-2.5**	**2.5-25**	**5≥**
The rate of sodium absorption of irrigation water or underground water	**10≤**	**18-10**	**50-25**	**50≥**
Decreased annual static depth	**10**	**30-10**	**50-30**	**50≥**
Increasing the number of fish with a water depth of less than 300 cm	**1**	**2**	**3**	**4≥**

From the perspective of speed

In order to study the desertification rate in terms of quantitative and qualitative groundwater quality, four main indicators have been identified: Annual increase of groundwater electrical conductivity (per cent per annum); Annual increase in the sodium absorption ratio of groundwater (per cent per year); Yearly decrease in water depth (centimeters per year); Annual decrease in the volume of groundwater reserves (million cubic meters per year).

- From the perspective of natural talent

To assess natural talent, 3 main indicators have been identified:

Sensitivity of geological formations to water quality degradation factorsClimatic changes (drought periods) And groundwater nutrition based on the storage factor

Survey erosion:

The quality of the process of erosion and wind erosion, especially in arid and semi-arid

regions, is one of the most important identifiers of desertification assessment, and even in a number of dry biomass, it is more important than water erosion. However, its evaluation of the process of water erosion is far more difficult, Because the flow direction of water can be easily determined, But the wind direction can be changed at any moment. To determine the wind erosion using aerial and satellite imagery, synoptic stations and field observations, the work units specified in the tables information are completed.

- The wind erosion condition in terms of current situation:

As shown in Table 2, Five indicators for assessing wind erosion from the perspective of the current state of desertification can be considered

Table 2. Evaluation and classification of wind erosion from the perspective of the current situation.

Degree and desertification weight ---------- Desertification factor	**Insignificant (2.5)**	**Average (5)**	**Intense (7.5)**	**Very intense (10)**
Amount of stacks currently (percent)	**5≤**	**5-15**	**15-30**	**30-≥**
Appearance of roots of plants (percent)	**25≤**	**25-50**	**50-75**	**75≥**
Current production compared to the pre-survey period (percent)	**85-100**	**65-85**	**25-65**	**25≤**
Thickness of the soil layer in cm	**90≥**	**50-90**	**10-50**	**10≤**
Stone and gravel on the surface of the earth (percent)	**50≥**	**25-50**	**10-25**	**10≤**

Methods for estimating current status indicators:

• Exploring the extent of stacks, using aerial photographs and satellite imagery and field studies;

- • Further indicators of soil soiling from the root, current production, soil layer thickness and rock and pebble increase with vegetation and vegetation cover, and satellite images and descents are obtained.

Methods for estimating speed indicators:

• The annual development of worn-out areas will be calculated using the sum of the figures obtained from the current wind erosion rating indicators for rows 1 and 5 divided by the length of the studied period (26 years);

• Annual increase in the amount of soil lost due to the combination of rows 1, 2 and 5 of the table of assessing the current status of wind erosion and its division into the length of the studied period can be obtained.

• The annual reduction of forage production, using row 3 of the table, assesses wind erosion from the perspective of the present situation and divides it into the length of the period under study.

From the perspective of natural talent:

Estimation of natural talent indices by obtaining meteorological statistics from relevant stations and determining the soil texture can be obtained from the land suitability map.

4-DISCUSSION AND CONCLUSION

After collecting the obtained results, the desertification status in terms of wind erosion and quantitative and qualitative groundwater quality were identified as maps in the basin of the Shor river in the province of Tehran as follows. As shown in the table -3 about 64% of the Shor river basins in the province of Tehran are currently (in terms of the status quo) in the middle level of wind erosion and 36% of it is in severe wind erosion.

If we should not have severe wind erosion based on the natural talent and 53% in moderate erosion and 47% in wind erosion. This indicates that the area is severely affected by desertification, especially in the southern parts of the basin. Unfortunately, the same situation applies to the quantitative and qualitative status of groundwater, the area of which is given in the table -4.

Table 3: The area of each unit in terms of wind erosion from the point of view of the current state of nature and natural abundance

Natural talent	Area (ha)	Speed	Area (ha)	An existing status	Area (ha)
Average	481740.9977	Average	500254.3	little	0
Insignificant	412596.1845	Insignificant	386135.4	Average	573284.8
Intense	0	Intense	7947.541	Intense	321052.3

Table 4: Area of each unit in terms of quantitative and qualitative drainage of groundwater

Natural talent	Area (ha)	Speed	Area (ha)	An existing status	Area (ha)
Average	3987200	Average	19025	little	398208
Intense	18011	Intense	389200	Intense	19018

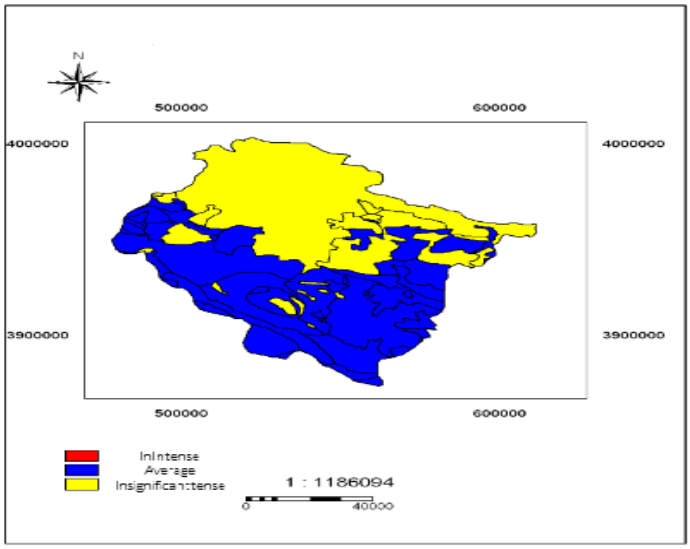

Figure1-Desertification map from the perspective of wind erosion

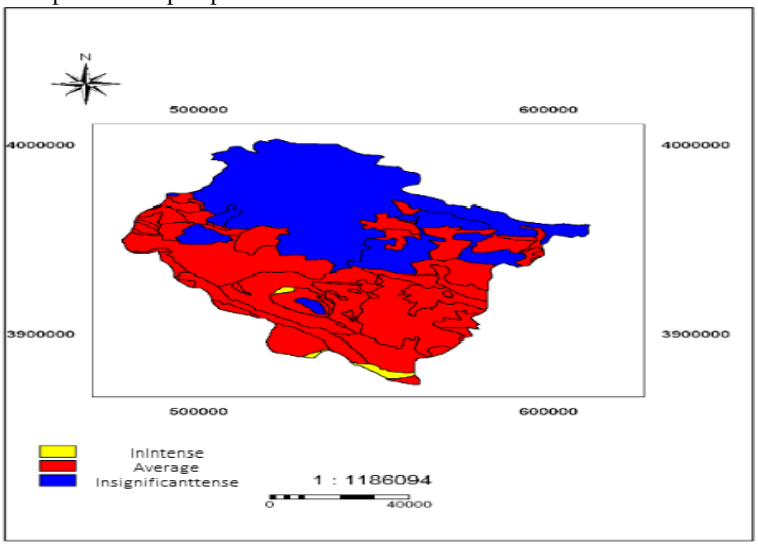

Figure2-Desertification map from the perspective of existing wind erosion

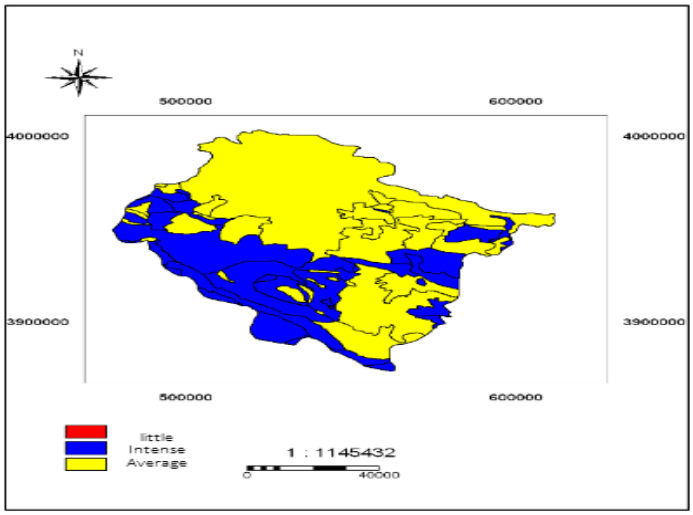

Figure3-Desertification map from the perspective of wind erosion

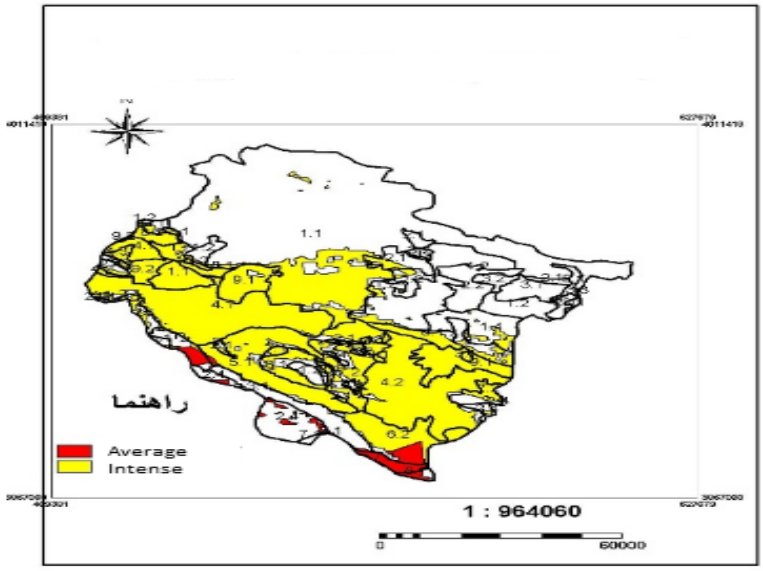

Figure4-Desertification map from underground water view

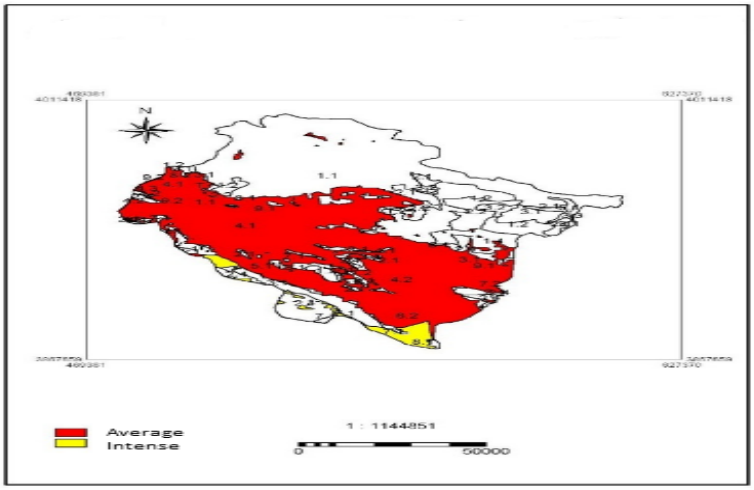

Figure5-Natural Desertification Capability Map from Groundwater View

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