Using the Fuzzy C-means Classification Method for the Need Water Determination of Lakes Bakhteghan & Tashk

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Extended Abstract

Introduction

Today, we have power to change the nature completely. This relates on the technological advances however in the case when we use the natural resource in non secure way, the environment will fall down soon. So what we called as a distortion of nature and environment are the results and products of the human wrong program and plans upon the land and environments. In the case of Lake Bakhtegan and Lake Tashk, building of many dams on the Kor & Sivan Rivers case to anarchy in the water catchment system. These lakes are the second vast internal lake in Iran which has $2/721/656\ h$, catchment area, its elevation form the sea level is about 1520m. The main resource of water supplying for the lakes are the Kor & Syvand Rivers. The river Kor's head spring is the mount Zagros and it joins to the Syvand River in the Marvdasht Plain and makes the River Korsyvand. Other resources for the lakes are permanent springs, rain and winter floods.

The dams building mainly related on the urban water supply and cultivation. Evident show that the lakes will change to a salty dessert soon. This conversion will lead to many environmental crises, like desertification, salt, destroying of ecosystem, etc. So we can say that, the environmental changes and crises are the productions of economical and political programs over the land by governments or other organizations. In the case of these two lakes, the building

of Droodzan and Syvand Dams, built without any real impact assessment evaluation on the periphery nature. This research's main challenge is to save the lakes. For doing that we need water. But how much water is suitable for saving the lakes? Thus over research's question is: How much water do the lakes need for surviving?

Having the fact, we explored the pervious researches, for examples; Aghelli & Sadeghi, (2002), emphasized on the environmental destroying trends in Iran. As well, Vafakhah & Rajabi explore the dryness condition in the lakes Tashk, Bakhtegan & Maharloo catchment area. As a result the pervious researches have not dealt with the need water for the lakes.

Methodology

For the determination of need-water volume in the GIS, we had applied the CUT/FILL function. This function work with two different layers: depth layer; which show the average depth in the lake area and the classification layer which show the existing water classes. The class layer derived via ETM satellite image, for doing this we used Fuzzy C- Means classification function, in the PCI Geomantic software. The function used the (2, 5, 7) bands for the classification, then the classification layer with 7 classes was derived.

The depth layer was built via elevation contour and elevation points. For this layer in the Arc GIS, the Topo Grid function applied.

Except these layers we used an image from Terra Satellite, to show the lakes condition in the drought seasons.

Results and Discussion

After the primary process upon the ETM Image, the lakes classified to the 7 different classes. Here water color and the light reflection which the satellite sensors delivered, determine the class. The classes are:

1) extreme deep
2) very deep
3) deep
4) average deep
5) a little shallow
6) shallow
7) very shallow

The whole need water of the lakes is 1592 million cubic meter. Albeit, the need water of every class differ.

- First class; (extreme deep): average depth of this class is 2/5 meter and the total area of the class is 40889 hectares. The need water of this class is about 1020.32 mm^3.
- Second class: with 19325 hectares area and 1.8 meter average depth, the need water of this class is 258.42 mm^3.
- Third class: with the total area of 16641hectares and 1.3 average depth, the need water of this class is 131.91 mm^3.
- Forth class, the need water of this class is about 80.88 mm^3.
- Fifth class: the need water of this class is about 97.04 mm^3.
- Sixth class: the need water of this class is about 2.47 mm^3.

- Seventh class: the need water of this class is about 0.98 mm^3.

Having the facts, if we want to save the life of these lakes we need 1592 mm^3 water from the Kor-Syvand River. More ever the lakes feed from the rain and other water resource which produce 100 mm^3 during a year. So with subtraction of this volume from the 1592 mm^3, the actual need water that the river must supply is 1492 mm^3, during the year. This volume of water must give to the lakes during the year especially in the summer.

The research showed that fuzzy c-means method of classification is one of the effective functions for layer classification. And finally the environmental crises in the third worlds directly depended on the economical and political decisions which the governments took.

Conclusion

What we called as a distortion of nature and environment are the results and products of the human wrong program and plans upon the land and environments. In the case of Lake Bakhtegan and Lake Tashk, building of many dams on the Kor & Sivan Rivers case to anarchy in the water catchment system. These lakes are the second vast internal lake in Iran which has 2/721/656 h, catchment area, its elevation form the sea level is about 1520m.

The dams building mainly related on the urban water supply and cultivation. Evident show that the lakes will change to a salty dessert soon. This conversion will lead to many environmental crises, like desertification, salt, destroying of ecosystem, etc. For the determination of need-water volume in the GIS, we had applied the CUT/FILL function. This function work with two different layers: depth layer; which show the average depth in the lake area and the classification layer which show the existing water classes. After the primary process upon the ETM Image, the lakes classified in to the 7 different classes. Here water color and the light reflection which the satellite sensors delivered, determine the class. The classes are: 1- extreme deep, 2- very deep, 3- deep, 4- average deep, 5- a little shallow, 6- shallow, 7- very shallow. The whole need water of the lakes is 1592 million cubic meter. Albeit, the need water of every class differ.

Keywords: Fuzzy Logic, C-Means Classify, GIS, Bakhtegan & Tashk Lakes.