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Research Article

A SPATIO-TEMPORAL APPROACH TO NATIONAL NATURAL RESOURCES: THE CHANGE OF PROVINCIAL WATER USE OVER TURKEY

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ABSTRACT

As time progresses, water issues get more importance over global and local agenda of the world. As is known Water issues associate with Geographical Science especially in terms of Water Resource Management, Demography and National Water Policy. From the outset, Statistics has been one of main disciplines supporting Geographical Sciences. The fact that recently Sub-branches of Statistics involves spatial properties, such as distance and contiguity, makes explanatory and descriptive power of statistics increased in geographical sciences. In this regard, Spatial autocorrelation is an useful tool to measure interaction among the adjacent units. In the study provincial water use in Turkey between 2004 and 2014 is examined by applying spatial autocorrelation. Moreover the change of water use between these years is analyzed. Thus the spatial characteristics of Water Use and its decennary change is determined. It is observed that Central Anatolia and its neighboring provinces encounters evidential water scarcity and East Anatolia gets its water resource into use between 2004 and 2014. This fact makes Integrated Water Management considerable method in order to sustain water use in reasonable level. National Water Policy ought to be constructed in accordance with this result.
Keywords: Spatial analysis, global spatial autocorrelation, spatio-temporal analysis, provincial water use, national water policy.

1. INTRODUCTION

Turkey possesses a dynamical socio-economical structure owing to the existence of both geopolitical significance and vibrant young population. This fact makes Turkey Researches fructiferous field in aspect of changes in time. Particularly water use and Demographical Researches are of significance in this respect. Water Issue in Turkey comes into prominence over time. That unavoidably gives rise to put Water Management on the agenda of the country. In the analysis of Water Management, Population, Agriculture and Industry are seen to have dominant shares in water use. Remarkably Agricultural usage plays major role.

In the study, The de cennary provincial water use per person between 2004 and 2014 and its change are analyzed by means of Spatial Autocorrelation. There is no doubt that statistics is one

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of chief disciplines to provide information and knowledge from data. Statistics, as it should be in every scientific fields, is a proliferous science incorporating new analyze methods day by day. In this regard, Spatial Analysis is one of Statistical methods giving better models to explain interaction of units having contiguity relation in a certain sense, especially in Geography. It can be said that Spatial Analysis recently starts to be used in Turkey. In the study, in order to investigate the interaction of Provincial Water Use, Spatial Autocorrelation Analysis is used.

Spatial Analysis is often used in many scientific fields. Especially Geographical Sciences is a field in which Spatial Approach is applied due to the significance of closeness and contiguity among the units. Spatial Autocorrelation is a method emerged as response of inquiry of Spatial effect. Furthermore for researching the changes throughout time over a domain, usually an area, Spatio-Temporal analyzes have been developed.

In literature there exist two approaches to spatial autocorrelation, global and local. Global Spatial Autocorrelation focuses on detecting presence of general spatial interactions, whereas Local Spatial Autocorrelation is relevant to significance of neighboringhood effect on a certain unit. In literature, Spatial Autocorrelation usually means just global spatial autocorrelation. In this study we deal with provincial water use in Turkey between 2004 and 2014 by using global spatial autocorrelation in order to examine general spatial patterns.

It can be said that Spatial Autocorrelation is used in a vast field, to visualize the fact, from genetics to economics. In genetics and Biology, DNA Diversity (Bertorelle & Barbujani, 1995) Migration and Selection in monecious diploids by using simulation (Sokal, Jacquez, & Wooten, 1989), Opportunities in behavioral ecology(Valcu & Kempenaers, 2010), Simulated Species (F Dormann et al., 2007) are studied by means of Spatial Autocorrelation. Evolvement of unscattered Natural Pine in Georgia USA is an example of usage of Spatial Autocorrelation Analysis in sylviculture (Reich, Czaplewski, & Bechtold, 1994). In medical survey, Scattering of AIDS in San Francisco USA for the period 1989 and 1993 (Ord & Getis, 1995) is investigated through the local methods of spatial autocorrelation.

Moreover in economics, distinctively Real Estate Appraisal is a main field in which Spatial Autocorrelation is often used. In literature Spatial Autocorrelation is observed to be applied many studies, such as House price analysis with other geostatistical analyses in Dallas TX (Basu & Thibodeau, 1998) and Spatial Dependence Analysis on Housing Prices in Taiwan (Hsieh, 2011).Furthermore Spatial Autocorrelation is used in order to analyze Patent Citation Data on Europe (Fischer & Griffith, 2008). Addition to these studies in economy, Provincial Unemployment Rates of Turkey is another example for this method (Kantar & Aktaş, 2016).

Naturally Spatial Analyses, especially Spatial Autocorrelation, are a helpful tool for transportation and its optimization. Trip Distribution Analysis in Urban Area of Cosenza in Italy is an example of the aforementioned fact (Mazzulla & Forciniti, 2012).

Last example fields of application for Spatial Autocorrelation are environment and climate studies. Point Based Spatial Autocorrelation on Thermal Pattern Analysis in Iran is such as to be a recent example (Ghalhari & Roudbari, 2016). Concordantly The necessity of Map of Heavy Metal and Nitrogen deposition on Extended Europe is examined whether a new map of some substances is to be remade, or not (Schröder, Pesch, Harmens, Fagerli, & Ilyin, 2012). Performance Prediction of Information Retrieval study can be given a sample for spatial autocorrelation usage in computer science (Diaz, 2007).

Many theoretical studies on Spatial Autocorrelation supporting and enriching Spatial Analysis and its applications are made. Legendre discusses whether Spatial Autocorrelation is advantageous, or not (Legendre, 1993). In order to ameliorate regression model, residuals are scrutinizated in using Spatial Autocorrelation (A. Cliff & Ord, 1972).

Apart from these studies, Latent Negative Spatial Autocorrelation is investigated (Griffith, 2006) and Local Estimation on simulated econometric data is made by Spatial Autocorrelation (López, Mur, & Angulo, 2010).

Other aspect of our study associates with Water Use. As concerns about water supply becomes more perceiviable, Water Use Literature flourishes. Especially Studies in China predominate the field on account of its rapid development in recent decade. Zhang and Anadon investigate multi-regional and provincial virtual water impression in China (Zhang & Anadon, 2014). Yao et al. mull over Regional Water Use Scenarios depending upon course of global socio-economy in aspect of China (Yao, Tramberend, Kabat, Hutjes, & Werners, 2016). Moreover Yang et al. discuss water use in context of water famine, mechanism of appraisal and legal reform for irrigated agriculture in Northern China (Yang, Zhang, & Zehnder, 2003). Li et al. analyze scattering of irrigation water productivity and propulsive cause for cereal harvest in Northwest China. USA is one of countries giving importance to studies of water use (Li et al., 2017) and its share in National Policy. (Billings & Day, 1989) investigates several principles for conservation pricing and sustainable demand management in the example of Southern Arizona (Billings & Day, 1989). Kenny et al. make the study in order to estimate water use in US in 2005 by using diversification of water use both in functional and in regional (Kenny et al., 2009). Aside from the studies in China and USA, Espinera and Nauges question the degree of sensitivity of the relation water use and price in experience of Seville Spain. Moreover this study produces helpful policy and advices for Water Use in Seville (Martínez-Espiñeira* & Nauges, 2004). Independent of field work, Price and Adams (Daniel J. Price, 2016) focus on Water use and Wastewater Management by using methods of earth sciences (Kaden & Rose, 2015) and Brian represents control tools and systems on the purpose of conservation and reduction of water use (Stone, 1978).

2. WATER POLITICS OF TURKEY

Issue of Water recently comes on to the top spots on International Agenda. Increasing demand for water and climate change caused by population increase, rapid urbanization and industrialization are prominent reasons for arousing attention of world opinion. There exists possibility of Water shortage transforming into Water crisis in the forthcoming 20-25 year in some regions including Middle East. Because of that, This irreplaceable natural source is generally agreed to be one of strategic resources in 21th Century.

Water Management Policy in Turkey is established by taking economic and social development in the country, priorities in water and food safety, criteria of EU and regional developments into consideration. Moreover, it is revised depending upon changing conditions. Turkey regards transboundary water as an opportunity for cooperativeness rather than as a conflict among riparian countries. Turkey argues that the issues about transboundary water should be discussed among only riparian countries. Contrary to popular opinion, Turkey in semi-arid climate zone is not a water rich country. That fact makes productive use of limited water resources and integrated water management essential. For the purpose of productive and sustainable utilization of hydro energy potential and of other benefits provided by water, necessary projects are carried out. Within this scope, the works related to construction of dams, hydroelectric power plants and irrigation projects are in progress.

International conventions about water use agreed so far does not provide equal and righteous approach to the rights of riparian countries.It is beyond dispute that Euphrates and Tigris Rivers possess superiority over Water Potential of Turkey. Therefore, they should be mentioned separately in National Water Policy.It is generally accepted that Euphrates and Tigris Rivers, merging when disemboguing, form one watershed. As it is, they are termed as Tigris-Euphrates River Basin System in general. Principal of two river one watershed is the sine qua non of Water Management of Turkey. That principle supposes that Total water potential of Tigris-Euphrates River Basin System is adequate to meet the needs of three riparian country, Turkey, Iraq and Syria, on the condition that benefits obtained from productive use of water and from new irrigation Technologies, are maximized. Then, in attempt to solve transboundary water conflicts

Turkey argues fair, rational and optimum use of water based on mutual and balanced benefit for riparian countries.

3. MATERIALS AND METHODS

3.1. Assumptions

In spatial autocorrelation analysis, How to define the neighboring (or contiguity in general sense)-weigh relation is crucial matter. In the study, the neighboring-weigh relation is of homogeneous characteristics. In other words it does not vary on the share of the neighborhood. Spatial Autocorrelation Analysis also assumes that Only interaction can be occurred in neighborhood relations among the units(A. D. Cliff & Ord, 1973).

3.2. Contiguity

For the studies including spatial autocorrelation, concept of contiguity, in other words determination of neighboring units, is of high significance. Queen and Rook contiguities are used. Whereas Queen contiguity is based on units sharing common borders and points, Rook contiguity is based on units sharing only common border. Then case of Queen contiguity includes the case of rook contiguity, in concept of neighboring unit set. But for administrative geographical units are adjacent to each other through a border not a point, Rook contiguity is sufficient to study. However earth field studies, for example square grid used, queen contiguity make difference (A. D. Cliff & Ord, 1973).

3.3. Spatial Autocorrelation

Spatial Autocorrelation is described as a measure for interaction among adjoint units. Furthermore Spatial Autocorrelation Analysis provides a mean to understand magnitude of a unit comparing its neighbors. Measure of Spatial Autocorrelation depends on the model to be chosen for the study and on indicator. Neighboring Weight is the fundamental factor to differentiate the measure Spatial Autocorrelation (A. D. Cliff & Ord, 1973). Neighboring Weight is described in board terms as

$$w_{ij} = \begin{cases} w_i(z_j) & j \in \text{ set of units in neighborhood of unit } i. \\ 0 & j \notin \text{ set of units in neighborhood of unit } i. \end{cases} \tag{1}$$

The function $w_i(z_j)$ is a special function to determine the effect of unit j. in neighborhood of unit i. In this study $w_i(z_j)$ is chosen as

$$w_i(z_j) = \frac{1}{\#N(i)} \tag{2}$$

Where #N(i)=number of neighboring units of unit i. Moreover this function ensures Arithmetic Mean based Spatial Autocorrelation for his study.

Another thing is Spatial Lag of Z. Spatial Lag is a feature to indicate effect of neighborhood of a unit. The Term “Lag” is borrowed from Time Series Analysis because lag of time is conceived as temporal neighborhood, naturally one way and backward. Spatial Lag of is described as

$$wz_i = \sum_{j=1}^{n} w_{ij} * z_j \tag{3}$$

In fact, Global Spatial Autocorrelation is nothing but a magnitude to measure interaction between z and wz (A. D. Cliff & Ord, 1973).

3.3.1. Moran's I

Moran's I is a measure of Global Spatial Autocorrelation (Geary, 1954; Moran, 1948, 1950). It is literally defined for as

$$I = \frac{N}{\sum_{i=1}^{N}\sum_{j=1}^{N} w_{ij}} * \frac{\sum_{i=1}^{N}\sum_{j=1}^{N} w_{ij} * (x_j - \bar{x}) * (x_i - \bar{x})}{\sum_{i=1}^{N} (x_i - \bar{x})^2} \tag{4}$$

Where N is the number of spatial units, x_i and w_{ij} defined above. Under Z-Score Standardization and the Weight structure defined above, the definition of Moran's I is reduced the form as follows

$$I = \frac{1}{n-1} \sum_{i=1}^{n} wz_i * z_i \tag{5}$$

It is an equivalent form of version of Moran's I formulations in literature under the assumption of this study. Moran's I is in the interval (-1, 1). By the same token Moran's I is nothing but the slop of regression line between z and wz (Moran, 1948).

If Moran's I is close to -1 then the units with big and small magnitude tend to become neighbour with each other. That is to say, it can be observed that the units with big and small magnitude is adjoint in most part of map. In case of that it is equal to -1, the map resembles the chessboard. If Moran's I is in small neighborhood of 0, the dispersion magnitude over the units in the map is of random character. If Moran's I is close to +1 then the units with big and small magnitude tend to be distinctly clustered in magnitude. The magnitudes of unit are heterogeneously dispersed on the map. Another issue is the importance of Expected Value and Variance of Moran's I. Because we focus on all provinces of Turkey, The parameter Moran's I is a parameter of Population. Then Estimation of Moran's I is not in question.In other words, significance of Moran's I, statistical parameter, is out of question.

3.4. Study Area and Datasets

In Turkey Province (Turkish: İl or Vilayet in older usage) is the most important administrative unit because it is unit of basic division of Turkey. Although Turkey is a central goverment, Provinices can be said to have semi-autonomous administrative rights limited by central goverment. For example provincial subvention is managed by elected provincial councils involved in provincial governorate or municipality up to size of provincial population. This circumstance influences infrastructure works, such as water supply line and sewage system, particularly by means of councils in municipality. Then in this study we choose provincial level for these reasons. Moreover Data in Provincial level is one of the most reliable data to be obtained from related institution, such as TUIK (Institute, 2016) whereas Data in County (Turkish: İlçe) level is tend to give rise to missing value.

3.4.1. Population

In Turkey, The Census has been made by using Address-Based Population Registration System since 2007. The last census taking precedence of 2007 was applied with Curfew in Classical way in 2000. 2004 Data is acquired by interpolation using the data 2000 and 2007.

3.4.2. Water Use

Water Use Data in 2004 and 2014 are based on The Data given by Local Administrations (Institute, 2016). The Unit is m3. As for the meaning Water Use, in the study Provincial Water Use is interpreted as an indicator Provincial Water Potential although Water Use data include only quantity passing through Water counter. The news from Local Press are such as to support our approach in the study.

3.5. Data Transformations

It is obvious that Water Use strictly depends upon Population. For Population of each province is different, this difference reflects upon Water Use. In order to understand real provincial water use, Provincial Water Use per person is computed for each province for 2004 and 2014 as follows

$$x_{i,k} = \frac{WU_{i,k}}{P_{i,k}} \tag{7}$$

Where $WU_{i,k}$=*Water Use of i.th Province in year k,* $P_{i,k}$= *Population of i.th Province in year k and* $i = 1,2,\ldots\ldots 81$, $k=2004,2014$

The change of Water Use between 2004 and 2014 is computed as

$$c_i = \frac{x_{i,2014}}{x_{i,2004}} \tag{8}$$

Then Z-Score Transform is applied to Provincial Water Use on the purpose of more apparent comparison. Z-Score is defined as

$$z_i = \frac{x_i - \mu_x}{\sigma_x} \tag{9}$$

Where x_i is spatial variable, μ_x = *mean of* x_i *and* σ_x = *standart deviation of* x_i. Furthermore This procedure makes the data unitless (Kreyszig, 1979).

4. RESULTS

4.1. Spatial Autocorrelation Groups for Water Use in 2004

Moran's I index for Water Use in provincial level is 0,1286. This means that Water Use in 2004 is of very weakly clustered structure.

High-High: The Group 'High-High' is defined as a set of provinces of which both Z and WZ is above zero, in other words, the average of water use in 2004. The group consists of 24% of all provinces. This group consists of two clusters. One includes provinces in Aegean, Mediterranean coasts and Central Anatolian region. Another includes provinces in East Marmara Region. Apparently Water Uses of Yozgat (WZ/Z=101%) and Kayseri (WZ/Z=104%) in this group are almost equal to the average of value of provinces in their neighborhood. Yalova (Z=5,7) possesses the greatest Z-Score Rate for Water Use in 2004. Whereas Yalova and Karaman have extremely higher water use than provinces in its neighborhood even in Turkey. Neighborhood of Mersin and Antalya is rich in water resources.

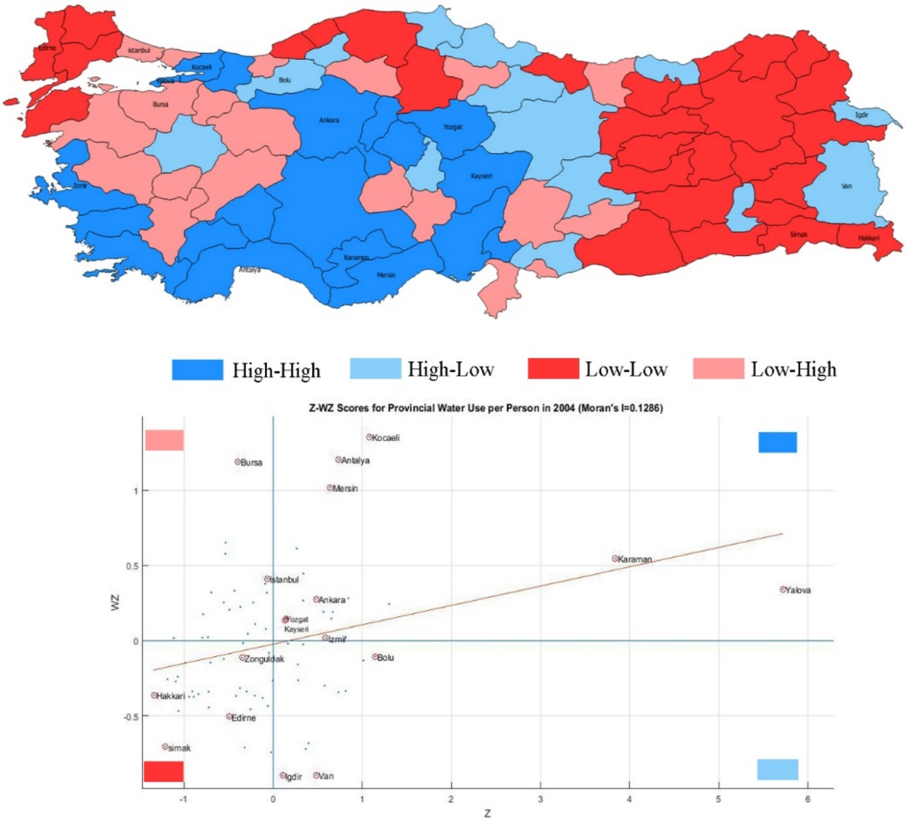

Figure 1. Spatial Distributions of Water Use groups onTurkey Map (2004) and Z-WZ Scores for provincial Water Use per person graph

High-Low: The Group 'High-Low' is defined as a set of provinces of which Z is above zero and WZ is below zero in other words, the provinces possessing much higher water use than neighboring provinces do. The group consists of 14% of all provinces. Provinces in this group can be described as "water giver" for neighboring provinces. However the group is of scattered structure, the group includes a transitional segment between High-High and Low-Low groups (From Sinop to Malatya, even Gaziantep). Samsun, Igdir and Kutahya are tend to have locally higher water use than provinces in its neighborhood. Particularly Igdir and Van are two relatively rich-in-water use provinces among water-poor provinces.

Low-Low: The Group 'Low-Low' is defined as a set of provinces of which both Z and WZ is below zero, in other words, the average of water use in 2004. Tragically the group consists of 35% of all provinces. It has the greatest share on map. However the group is of scattered structure, It makes itself evident on the east of Turkey. Ordu is an exceptional example for water use among in provinces east black-sea coast. Edirne (WZ/Z=102%) in this group is almost equal to the average of value of provinces in their neighborhood. Whereas Erzincan have locally higher water use than provinces in its neighborhood, Corum have locally lower water use than provinces in its neighborhood. Sirnak is the poorest in water use province with regard to herself and her neighborhood. Moreover Zonguldak is one of the fittest provinces for spatial autocorrelation model.

Low-High: The Group 'Low-High' is defined as a set of provinces of which Z is below zero and WZ is above zero in other words, the provinces possessing much lower water use than neighboring Provinces in this group can be described as "water taker" or "needy for water" for neighboring provinces. The group consists of 19% of all provinces. The group is of highly scattered structure except provinces neighboring Kutahya. Istanbul has the highest water use in the group. Giresun, Usak and Adiyaman are tend to have locally lower water use than provinces in its neighborhood. Bursa and Istanbul has locally lower water use than provinces in its neighborhood.

4.2. Spatial Autocorrelation Groups for Water Use in 2014

Moran's I index for Water Use in provincial level is -0,0259. This means that Water Use in 2014 is of randomly clustered structure. Structure is drastically evolved from clustered to randomized between 2004 and 2014. It is a supporting fact for the case that Number of outliers increases over the level in 2004.

High-High: The Group 'High-High' is defined as a set of provinces of which both Z and WZ is above zero, in other words, the average of water use in 2014. The group consists of 24% of all provinces, as in 2004. However the group is of scattered structure, it includes a big segment from Izmir to Giresun via Adana. Whereas Water Uses in Bitlis, Batman and Tunceli (Average WZ/Z of three provinces = 10.74%) are very ahead of their neighboring provinces, Istanbul, Izmir and Sivas (Average WZ/Z of three provinces = 275,5%) are very behind in their neighboring provinces. Giresun (WZ/Z=98%) can be said to be a reflection of its neighborhood. Although Yalova keeps up to be an outlier, she gets near to the average of provincial water use. Kocaeli is one of the most stable for holding her place in Z-WZ scattering plot.

High-Low: The Group 'High-Low' is defined as a set of provinces of which Z is above zero and WZ is below zero in other words, the provinces possessing much higher water use than neighboring provinces do. The group consists of 22% of all provinces. Provinces in this group can be described as "water giver" for neighboring provinces. Sakarya is strikingly ahead of their neighboring provinces in water use. Taking into account water use in its neighborhood, alarm bells start to ring for Amasya. Sakarya and Karabuk are outlier provinces in this groups.

Low-Low: The Group 'Low-Low' is defined as a set of provinces of which both Z and WZ is below zero, in other words, the average of water use in 2014. Hopefully the group consists of 27% of all provinces, behind the figure in 2004 It has the greatest share on map. When glancing at the group, Provinces in Central Anatolia Region encounter a serious water shortage. Because both its Z-score and vale of WZ, Spatial Lag, are very low, Igdir is said to have a serious matter on water use. Kutahya, Elazıg and Nevsehir are relatively comfortable in respect of water use. Edirne and Kirklareli are poorer than average of their neighborhood being poor in water use. As a consequence it can be said that Thrace region encounters serious water problem.

Low-High: The Group 'Low-High' is defined as a set of provinces of which Z is below zero and WZ is above zero in other words, the provinces possessing much lower water use than neighboring provinces do. Provinces in this group can be described as "water taker" or "needy for water" for neighboring provinces. The group consists of 27% of all provinces. Whereas Bursa is considered to be lucky for providing water from provinces in neighboring, Sanliurfa and Nigde are unlucky for this respect. Bursa is one of the most stable for holding her place in Z-WZ scattering plot. Bingol, Burdur and Karaman can be named as transition provinces between the groups High-High and Low-Low.

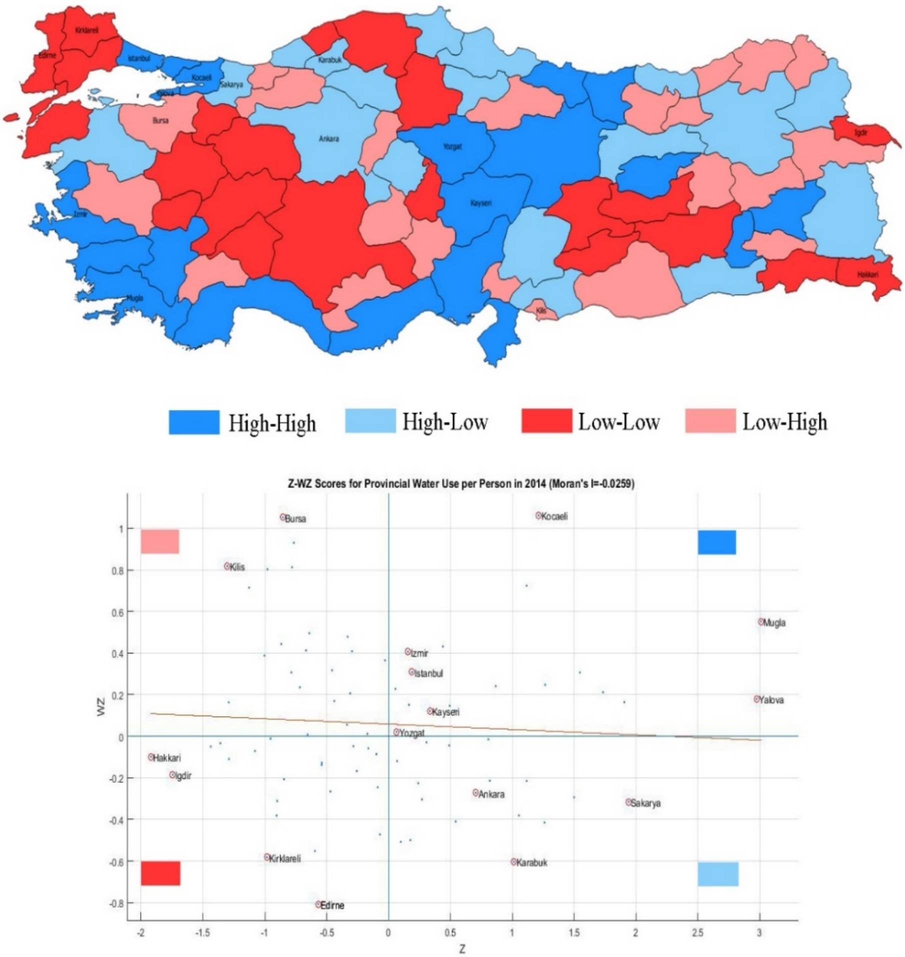

Figure 2. Spatial Distributions of Water Use groups onTurkey Map (2014) and Z-WZ Scores for provincial Water Use per person graph

4.3. Spatial Autocorrelation Groups for The Change of Water Use between 2004 and 2014

Moran's I index for Water Use in provincial level is 0,0444. This means that Change of Water Use between 2004 and 2014 is of slightly clustered structure. Whereas East of Anatolia has a visible increase in Water Use in ten years mentioned above, West of Central Anatolia comes up against a severe decrease in time period mentioned above. Another point to take into consideration is Z-Score interpretation over

Whereas Change Rates are interpreted depending upon 100%, Z-Score is interpreted by basing on the average of Change Rates. This fact may give cause for a confusion of interpretation.

To illustrate, A Change rate of a province may be 105 % but average of provincial change is %110, Then Z-Score for the province will be negative but real change is positive. In some cases, negative Z-Score for change rate is misinterpreted as a negative change.

In truth negative Z-Score for change rate means to be below average of change rate, not to be negative change, namely below %100. Fortunately in the study the average of change rate is 102% and there is no provincial change rate between %100 and 102 %. Then there is no confusion.

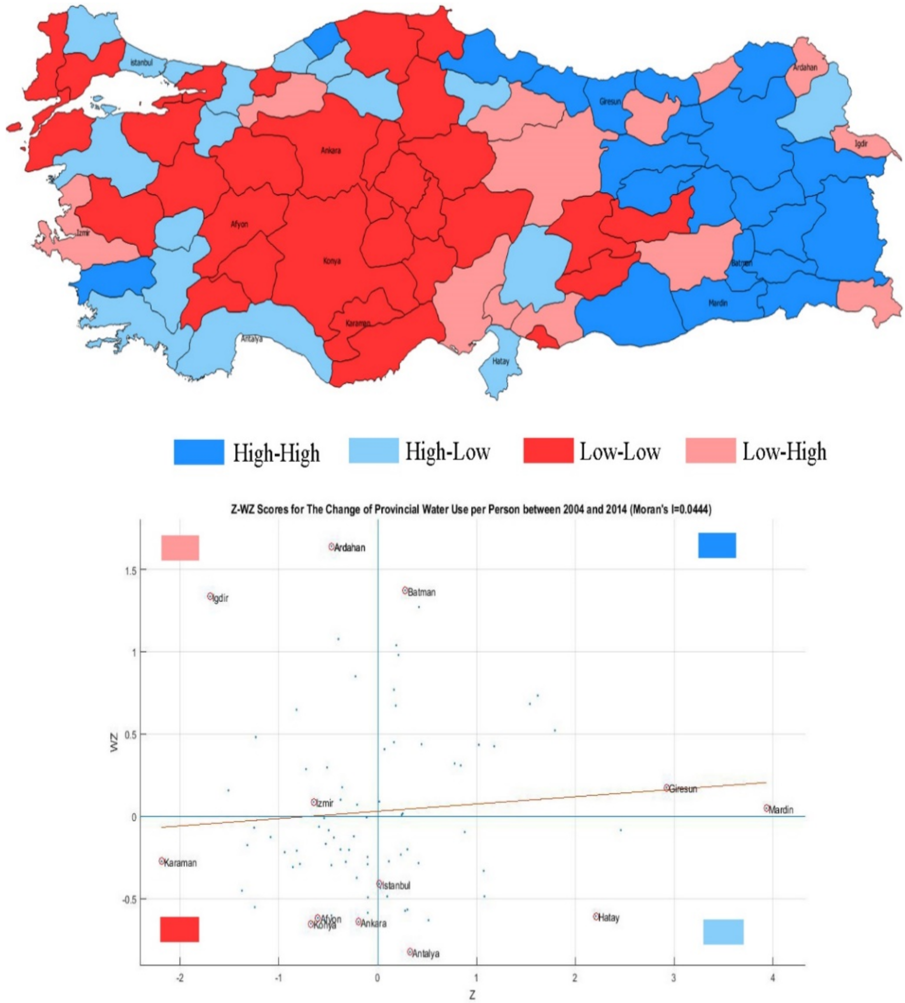

Figure 3. Spatial Autocorrelation Groups for The Change of Water Use between 2004 and 2014 (2014) and Z-WZ Scores for the change of provincial Water Use per person between 2004-2014 (Moran's I=0,044)

High-High: The Group 'High-High' is defined as a set of provinces of which both Z and WZ is above zero, in other words, the average of water use change between 2004 and 2014. The group consists of 26% of all provinces. The group is of clustered structure, except Aydin and Bartin. The group dominates over the east of Anatolia, in other words between 2004 and 2014 Water Use of Provinces in East Anatolia increases almost all-together. Mardin and Giresun exceptionally boost their water use and become obvious outliers. In addition to that Giresun is one of the fittest provinces for spatial autocorrelation model. Moreover the provinces in neighborhood of Batman possesses positive significant change. Consequently East Anatolia Project (Kolars & Mitchell, 1991; Republic, 2016) is said to be successful in increasing water use and regional development (Turkey, 2016).

High-Low: The Group 'High-Low' is defined as a set of provinces of which Z is above zero and WZ is below zero in other words, the provinces possessing much higher water use than neighboring provinces do. The group consists of 20% of all provinces. It can be said that the group is of scattered structure. Antalya has a delicate situation because drastic decrease in her neighbors (Z=0.326 and WZ=-0.824) Hatay is an outlier, of that change is remarkably positive but neighboring have negative change.

Low-Low: The Group 'Low-Low' is defined as a set of provinces of which both Z and WZ is below zero, in other words, the average of change of water use between 2004 and 2014. Despairingly the group consists of 38% of all provinces. Obviously it has the greatest share on map. Provinces in Central and West Anatolia Region have a drastic decrease in water use. Particularly Karaman, Yalova and Malatya face a serious water supply problem. Moreover Duzce is considered as relatively lucky member in group (Z=-0.112 and WZ=-0.006), owing to Sakarya and Zonguldak. Local and Global press give report about the fact in subsequent years.

Low-High: The Group 'Low-High' is defined as a set of provinces of which Z is below zero and WZ is above zero in other words, the provinces possessing much lower water use than neighboring provinces do. Provinces in this group can be described as "water taker" or "needy for water" for neighboring provinces. The group consists of 16% of all provinces. The group is of highly scattered structure. Igdir and Ardahan are said to be extremely dissimilar with its neighbors. Diyarbakir is deemed as transition province between groups 'Low-Low' and 'High-High'. Izmir, thanks to effect of Aydin and Balikesir, falls into the group.

5. DISCUSSION AND CONCLUSION

The Change in Provincial Water Use is of vital importance with regard to sustainability of water (given the data in 2004 and 2014). Because Groups of 60% provinces are changed, then it can be said that Structure of Provincial Water Use is drastically evolved in ten years between 2004 and 2014. This fact make new approaches to Water Management indispensable. In the light of Spatial Analysis on Provincial Water Use between 2004 and 2014, the following results may be concluded.

The fact that Provincial Water Use depends on Provinces in its neighborhood make integrated Water Management put on the agenda. Provinces sharing the same watershed highly interact each other due to common water resources. Otherwise the conflict over water management among provinces may turn out.It is vital to point the fact that Provincial water use can be evaluated in many way. There is an important point to switch the results of the research. Low Water Use may be interpreted as water paucity but also be interpreted as efficient water use. For example in recent years, the application of drip irrigation methods gradually increases in agricultural activities. However Konya is faced with a grave water scarcity such that pothole collapses occur in remarkable numbers in the region. Moreover, the location of province gives clue on how to evaluate the data from the province. For example, East Black Sea watershed indicate almost domestic and industrial water use. That is why agricultural water use in East Blacksea watershed equals to nearly zero owing to rainy climate in the region.

Central Anatolia have increasingly big trouble on Water Use and its management. Then this case requires immediate action based on integrated watershed management.East of Anatolia has prosperous water resources and increases its water usage. However Provinces in east Anatolia should find the ways to conserve their resources and to use water rationally.

To sum up, The Gap between Central Anatolia and East of Anatolia in water use should be one of major issue to contribute National Water Policy on the purpose of a down-to-earth and sustainable use of national water resources.

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