EXPLORING THE RELATIONSHIP BETWEEN THE SOCIO-ECONOMIC STRUCTURE AND SOME TOPOGRAPHIC VARIABLES IN ÇANKIRI

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Prof. Dr. Canan ÖZGEN
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

Assoc. Prof. Dr. Oğuz IŞIK
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

Assist Prof. Dr. Lütfi Süzen	Assist Prof. Dr. Şebnem DÜZGÜN
Co-supervisor	Supervisor

Examining Committee Members

Assoc. Prof. Dr. Oğuz IŞIK	(METU, CRP)	
Prof. Dr. Vedat TOPRAK	(METU, GEOE)	
Assist. Prof. Dr. Zuhal AKYÜREK	(METU, GGIT)	
Assist Prof. Dr. Şebnem DÜZGÜN	(METU, GGIT)	
Assist Prof. Dr. M. Lütfi SÜZEN	(METU, GEOE)	

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Naci Dilekli

ABSTRACT

EXPLORING THE RELATIONSHIP BETWEEN THE SOCIO-ECONOMIC STRUCTURE AND SOME TOPOGRAPHIC VARIABLES IN ÇANKIRI

Dilekli, Naci

M. Sc. Department of Geodetic and Geographical Information Technologies
Supervisor: Assistant Prof. Dr. Şebnem Düzgün
Co-supervisor: Assistant Prof. Dr. H. Lütfi Süzen

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This study aims to develop a method to investigate the relationship between socio-economic status of village settlements and some topographic variables using geographical information systems (GIS) and spatial statistical methods. The study area is Çankırı province, a mountainous region that lays at the northeast of Ankara. 331 villages represented by areal units are used in this study.

195 variables are used to extract a single socio-economic status indicator. First, all the variables are divided under three groups, namely economic, social and service. Principal Components Analysis (PCA) is used to construct an index indicating socio-economic status. The parameters that represent natural environment are; mean elevation, mean slope, mean aspect and the ratio of high quality soil in the total area, for each settlement unit. The data is visualized

by choropleth, cartogram and 3D techniques. Then it is explored by using correlograms, spatial moving averages and geographically weighted regression (GWR). Finally linear non-spatial regression and spatial regression methods are utilized in order to establish a relation between the socio-economic status and environmental parameters.

Key words: GIS, Spatial Statistics, Socio-economic status, Environmental Factors, Çankırı

ÖZ

ÇANKIRI'DA SOSYO-EKONOMİK YAPI VE BAZI TOPOGRAFİK DEĞİŞKENLER ARASINDAKİ İLİŞKİNİN İNCELENMESİ

Dilekli, Naci
Yüksek Lisans, Jeodezi Ve Cografi Bilgi Teknolojileri
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Bu çalışma Coğrafi Bilgi Sistemleri (CBS) ve mekansal istatistik yöntemleri kullanarak sosyo-ekonomik statü ve bazı topografik değişkenler arasındaki ilişkiyi incelemeyi amaçlamaktadır. Yöntem, Ankara'nın kuzeydoğusunda bulunan, daglık bir alanı kapsayan Çankırı ilinin 331 köy yerleşkesinde uygulanmıştır.

Sosyo-ekonomik statü göstergesini elde etmek için 195 değişken kullanılmıştır. Öncelikle bütün değişkenler üç grup altında toplanmıştır. Temel Bileşenler Analizi sosyo-ekonomik statü göstergesi elde etmek için kullanılmıştır. Doğal fiziksel yapıyı temsil eden parametreler; her yerleşim birimi için, ortalama eğim, ortalama yükseklik, bakı skoru, ve yüksek kabiliyetli toprağın toplamdaki oranıdır. Veri koroplet, kartogram ve 3 boyutlu sembollerle görselleştirilmiştir. Sonrasında, korelogramlar, mekansal hareketli ortalama ve coğrafi ağırlıklı regresyon analizi ile incelenmiştir. Son olarak veri lineer mekansal olmayan regresyon ve mekansal regresyon ile modellenmiştir. Modelleme işleminde

bağımlı değişken sosyo-ekonomik statü, bağımsız değişkenler ise doğal yapı parametreleridir.

Anahtar Kelimeler: CBS, Mekansal İstatistik, Sosyo-ekonomik yapı, Çevresel Faktörler, Çankırı

To My Parents

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CHAPTER I

INTRODUCTION

It has always been a puzzling question, why some are wealthier than others. This question may rise at smaller scales, for example when comparing two farms; why one is more productive and therefore richer, and other is not. These farms may be in very distinct places; but not necessarily. Differences can be seen even in adjacent farms. Scale may change when comparing different unit sizes: villages, cities, intra national regions, nations, or even larger scales including comparison of groups of nations. Scales may change, however the question remains the same; "Why are some richer and more developed?"

The answer depends, to some extend, on the scale. When explaining a farm's revenue, it would be much related to soil fertility, the type and range of plants sowed and the agricultural techniques used. The answer becomes more complex as the scale increases. How can the level of a whole country be explained? This question may be explained by pure geographical influences, or by social systems, culture, values and politics. It is clear that one may get lost when trying to explain the whole set of reasons without failing. Furthermore, justification of intangible causes of many factors is almost impossible.

In this study, therefore, a simplistic approach has been adopted. It is mainly the basic topographical parameters of environment that will be used to explain human progress. The fundamental point is that the physical structure has different characteristics in different locations. Such differences lead to the fact that, the environment is sometimes an obstacle, and sometimes an opportunity. Also it is known that some certain types of land are easier to utilize, while some other are more troublesome for a society's development. Beside, the human beings' creativity and power to overcome the difficulties which are brought by the nature is well known. Moreover, not every single society is the same in the behavior to exploit and utilize nature.

It is the question of "How much does the environment affect the level of society with respect to its prosperity and development?", that will be tried to be answered by this study. The aim of this thesis is to assess the possible effects of nature on the socio-economic structure of a settlement. For this purpose, the village settlements in Çankırı are used.

Mentioning the environment's effect on society may remind the reader of geographical determinism. That is why a considerable amount of the thesis is devoted of the inspection of idea and its possible linkage to this thesis.

In order to find whether there exists a relationship between the socio-economic structure and the physical structure and its strength, quantitative methods mainly dependent on Geographic Information Systems (GIS) and statistical analyses are necessary. The tool GIS is important here, because it is the spatial data that will be dealt with, and there is an obvious need for and geo-based system with a number of analyses capabilities.

At the starting point, this study can be seen as a product as influenced from the curiosity about the factors leading to the progress of man. Therefore, people trying to understand the reasons lying behind development and underdevelopment may find this study useful. The findings in this thesis can form basis for policy development. Moreover, this study shows the use of GIS coupled with spatial statistical methods in understanding the spatial distribution of socioeconomic and environmental parameters.

1.1. Study Area

Çankırı lies in the north Anatolia between the Kızılırmak and West Blacksea main river basins, Turkey. It is located between 40^0 30’’ and 41^0 northing, 32^0 30’’ and 34^0 easting. Its mean elevation is 723 meters, and has an area of 845111 hectares as seen in Figure 1.1. Elevation of the region ranges from 400 m to 2400 m at Ilgaz Mountain.

Çankırı is a suitable region for such an analysis to evaluate environment’s effect on the development. There is a vast variety of environmental and climatic conditions (also shown as the differences between the Merkez and Çerkeş townships in Table 3.1) in Çankırı, so that the influence of such conditions can be revealed easier.

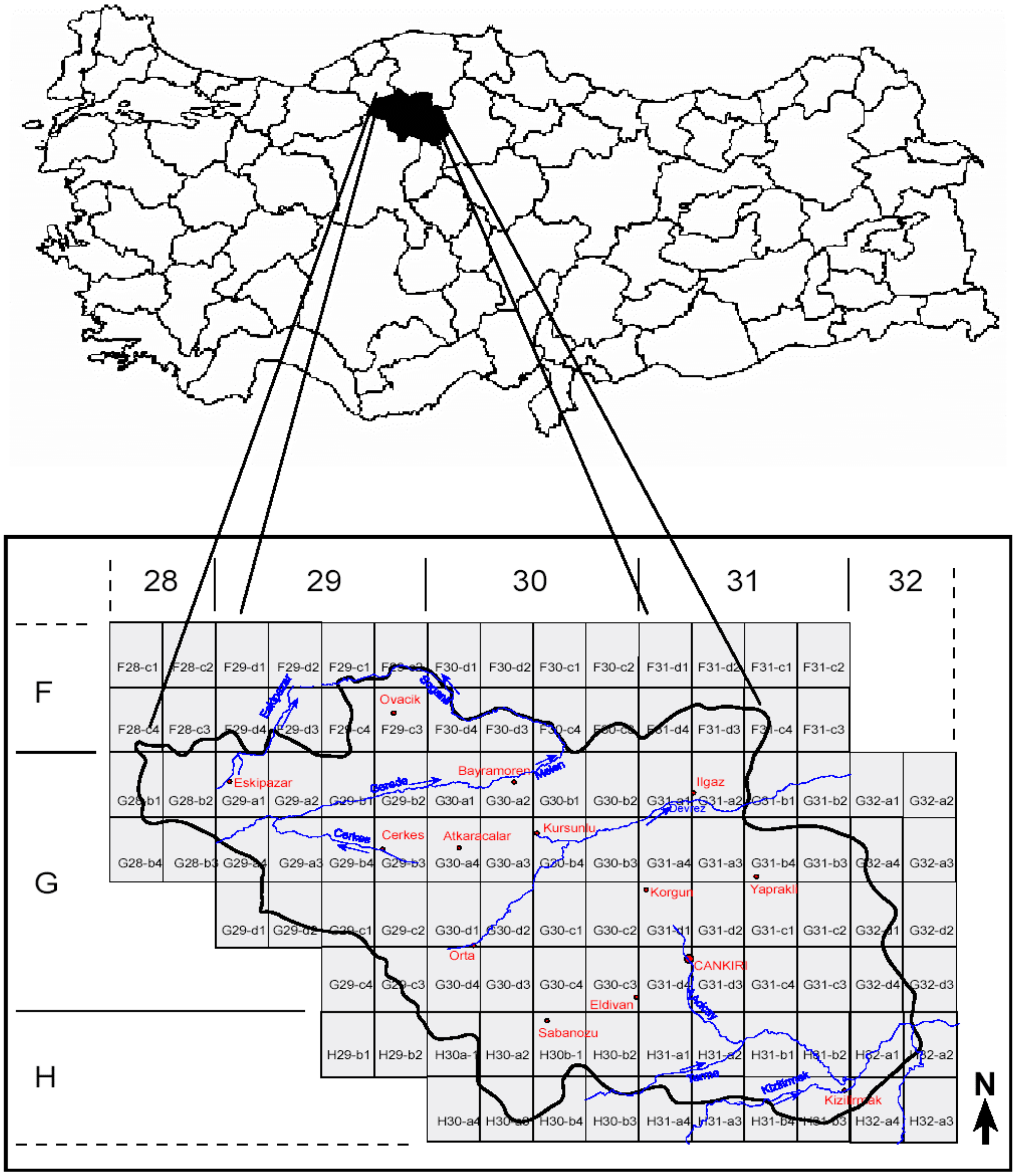

Figure 1.1. Location map of the study area. Grey rectangles are 1:25.000 scale topographic maps. Blue lines show major streams in the study area. (Source: Sürmeli, 2003)

1.2. Method of Study

Most of this thesis is completed as an office work. The office work is composed mainly of computer utilities such as digitizing graphics, tabular data inputting and processing.

Data Used:

- Tabular data collected from a rural survey of Çankırı region made in 1980 by from General Directiore of Rural Services. These data were used to extract a single index indicating the socioeconomic status.
- 1/25.000 scaled maps with the boundaries of the villages of Çankırı, taken from State Institute of Statistics. These maps were used to digitize those boundary polygons.
- A DEM (SRTM) of the area with 90 meters spatial resolution was used to extract topographical features of the area.
- Land Fertility Maps were taken from General Directiore of Rural Services. These maps provide information to extract the amount of high capable soil for each village settlement.

1.3. Organization of Thesis

The rest of this thesis is organized as follows:

Chapter II is devoted to present the ideas available in the literature to explain the phenomenon of human progress. First, the idea of environmental determinism is emphasized, as it embodies the similar arguments used in this thesis. However, it would be unfair to only include environmental determinism as it is many times crucially criticized, and it is argued that environment is not the only or the most powerful determinant of human progress. Therefore, criticisms of environmental determinism, and also another recognized determinant; culture are discussed. This chapter ends with the discussions of how the environment should be studied in a proper way.

Chapter III reviews the theoretical basis for spatial data analysis. It starts with discussing the importance of Geographic Information Systems (GIS) and spatial statistics, and how they relate to each other. The analysis of area data is emphasized, through visualization, exploration and modeling stages.

Chapter IV presents the developed methodology for assessing relationship between socioeconomic structure and environmental parameters that are used in the study. This begins with discussions of socio-economics (which is the phenomenon studied as the dependant variable) and socio-economic index determination with background studies. Before the environmental parameters used are presented, a general information about the natural structure of Çankırı was given.

Chapter V describes the implementation of the developed method and the analyses carried out to assess relationship between socioeconomic structure and environmental parameters that are used in the study.

Chapter VI is the conclusion and recommendations part of the thesis. The results, why they came about as they did, and the problems faced with were discussed and explained.

CHAPTER II

BACKGROUND INFORMATION ON HUMAN DEVELOPMENT AND STUDY OF ENVIRONMENT

This chapter first deals with the two major recognized determinants of the human progress, which are environment and culture. The last part of this chapter is devoted to discuss how the environment should be studied.

2.1. On the Determinants of Human Progress

2.1.1. Environment and Geography

“[Geography] tells an unpleasant truth, namely, that nature like life is unfair, unequal in its favors; further, that nature’s unfairness is not easily remedied.”

(Landes, 1998)

It is generally thought that, environment is something that surrounds people. Yet, such an explanation is usually very simple and therefore insufficient. Hawley (1950) makes a deep explanation of environment, referring it as a generic concept that consists of all external forces and factors to which organisms are responsive. Environment compromises the raw materials and the conditions, which can be both favorable and unfavorable to organisms. The availability of necessary materials and conditions limiting the use of these materials constitute an ever-lasting problem for living creatures.

The environment can be simply classified as (1) inorganic and (2) organic. Inorganic environment consists of all the mechanical and nonliving conditions that surround an organism, such as light, air, pressure, humidity, temperature, minerals, topography, etc. The organic environment includes all elements of life whose activities affect an individual or group of individuals. Therefore, man’s organic environment consists of the vegetation that obstructs his movements, animals that prey upon him and upon which he preys, domesticated plants and animals, and most importantly, his fellow men (Hawley, 1950).

As Hawley (1950) put it, understanding what is environment is elusive; however comprehending what effects it has on people is even harder to grasp. Sack (1993) argues that the self evident powers of space and place are really complex and difficult to understand. People and objects interact in space and there could be laws of behavior which govern these interactions. It forces the models of how distance and the relative locations of people and things affect behavior. This view of thinking leads central-place models and gravity and potential models, all of which emphasize that space has an effect on interaction and that this effect is expressed as a function of distance (Sack, 1993).

2.1.2. Geographical Determinism

Also known as environmental determinism, or environmentalism, this idea means that geographical conditions have a role in shaping the human societies. Because of its commonsense logic, the idea has been rephrased through the time.

Frenkel (1994) refers to Semple (1911), who is considered to be one of the pioneers of this thought, especially for being the one that introduced the idea to the American Geography, by arguing that the environment was assumed to affect and to actually determine all the aspects of social and economic development. However, Harris (1968) shows that the idea goes back to early stages of the history of thought, long before the Enlightenment rooted in the Ancient Greek. He also gives examples from the Roman period, and among Arab geographers of twelfth and fourteenth-century, from whose works, eighteenth-century understanding of geographical determinism was also influenced.

Diamond's "Guns, Germs and Steel" (1997) can be seen as one of the most recent works, directly reflecting geographical causation. He evaluates the human progress from a broader perspective. He indicates, around 11000 BC, all people of all continents were hunter-gatherers. This means all those people were almost equal in their development level. Different rates of development on different continents, from 11000 BC to 1500 AD, were what led to the technological and political inequalities of AD 1500. Accordingly Diamond (1997) asks, why did human development proceed at such different rates on different continents? He argues it was the same kind of man that originated in Africa in the beginning, then spreading over all the different geographies the world. However, when the history is examined, innate differences among people are obvious. Therefore, the progress shouldn't be much linked with the capability of man, which is many times linked to the biological features, but rather the environment that surrounds him.

2.1.2.1. From Ultimate to Proximate Factors

The progress is many times explained with previous achievements and advances. As Sachs (2000) maintains, technological innovation operates like a chain reaction in response to initial stock of ideas, boosting the progress, and widening the gap between the rich and poor at the same time. Harris (1971) also argues that the pre-existing mode of production determines the spread and development of new technologies. Similarly Diamond (1997) says, guns, nasty germs and steel can be seen as the reasons why Europeans dominated the world. However, Diamond (1997) also points out that this explanation is yet incomplete. Because such an explanation offers only a proximate (first-stage) explanation. This in turn invites the search for ultimate causes, the causes that led to the emergence of guns, germs, and steel.

Diamond (1997) further argues that the whole modern world has been shaped by lopsided outcomes. Hence they should have inflexible explanations, which should be more basic than some details related to battles won, inventions developed, or accidents faced on some occasion. All these facts should be then explained by the ultimate forces, which are the environmental forces (Diamond, 1997).

2.1.2.2. The Climate

Climate has been viewed as an important factor for explaining food production, human behavior and health. Its explanatory power is generally derived from the comparative characteristics of tropical and temperate climates. Tropical climates offer high temperature and irregular rainfall patterns. The latter on the other hand, provide mild temperature and regular rainfall.

Climate diversity and its effect on human life is shown by Landes (1998), as he asserts that throughout the world, there is a wide range of temperature patterns which depend on location, altitude and declination of the sun. These patterns are important as they affect the rhythm of activity of all species. As for human beings, they avoid the extreme climate conditions as much as possible. However, when compared, the discomfort of heat is much more than that of cold. The main reason is that, the human body must release heat to maintain a proper temperature. But if the cooling conditions are not sufficient in an environment, then the easiest way to overcome this problem is to avoid generating heat; in other words, keep still and don't work (Landes, 1998).

The problems created by tropical climates are shown with many cases. Bandyapadhyaya (1978) tries to explain backwardness of India by tropic climatic conditions. When compared, it is shown that the human energy which is the major determinant of the productivity of labor, is much lower in tropical regions than in the temperate zones. Bandyapadhyaya (1978) refers to Burridge (1944), a professor of medicine, finding that Indian workmen need longer rest pauses even for weaker strokes, compared the workers of the cooler climates. Burridge argues that this is an indication of the fact that high temperature causes low metabolic turnover (Bandyapadhyaya, 1978).

Food is also a major problem in tropical climates. In these regions, the plant food is low in protein and mineral content. Additionally the nutrition content is even more insufficient as the animal food is scarce and of poor quality. This malnutrition causes reduced work efficiency and higher risks of susceptibility to disease (Bandyapadhyaya, 1978). Landes (1998) similarly observed: biodiversity favors every species but man and his limited array of crops in Tropics.

The soil quality of the tropic lands is lower. It is because climatic conditions which bring about high humidity and temperature accelerate the decomposition of organic ingredients of the soil, and thus lower the nutritional content. This process is supported as the organic and mineral compounds are dissolved and removed by water running through the soil. In addition, due to very high evaporation rates and rainfall being lost as runoff, same amount of precipitation is less efficient than in the temperate zones. Therefore, even in the generally humid areas of the tropical countries therefore, there may be temporary droughts on a regular basis. (Bandyapadhyaya, 1978; Sachs, 2000) The situation is even worsened by high erosion rates, high incidence of agricultural and veterinary pests, increased spoilage of food in storage and reduced photosynthetic potential due to warm nighttime temperatures (Sachs, 2000).

Water sources are also scarce despite of high rainfall rates, as the rains are very irregular, and it is not much possible to store the water due to the high rates of evaporation (Landes, 1998; Sachs, 2000).

Another classic attribute of tropical climates, the illness rate is not high only because of malnutrition. Tropical climates also provide a suitable environment for the fast spread of diseases. Heat increases reproduction rate of life forms that are hostile to man, which in turn results in the faster transmission of disease. (Bandyapadhyaya, 1978; Landes, 1998; Sachs, 2000)

Food production and health conditions in tropics led to several other results that have larger-scale effects. Sachs (2000) argues, as the agricultural surplus is very low, a large proportion of the population engages with the agricultural activities. Another most obvious result is that, large populations live in the remote high altitude zones, which reduce the problems created by heat. Lower life expectancy and smaller accumulation of the human capital are also the products of the tropical climate (Sachs, 2000).

Bandyapadhyaya (1978) attracts to a more general but crucial point from the tropical climates' most clear and verifiable product which is the relatively low productivity of labor. He observes that low productivity of labor causes the final result of an unsound economic development, both in agriculture and industry.

Harris (1971) briefly explains the outcomes of environmental differences not for only tropics, but rather in general. He points that agriculture is not as efficient as in arctic or desert environments as in river valleys or well watered plains. Therefore, similar kinds of technologies in different environments may result in very different levels of output and amount and quality of labor, and this may in turn affect the social structure and system of economic management. The formation of entirely different settlement patterns depend on the form of irrigation, which in turn varies according to the size and dependability of the water supply, the availability of flat terrain, the amount of minerals in the water, and other conditions (Harris, 1971).

2.1.2.3. Land Features

It is obvious that some regions are more advantageous as they have natural resources, especially strategic energy resources and precious minerals. Additionally, other factors like access to the efficient transportation nodes like coasts and navigable rivers and proximity to other developed regions are also important favorable factors. (Sachs, 2000) Similarly, Landes (1998) points out that, it was not an accident that civilizations were founded close to the rivers, as they provided advantages.

Additionally, states rather than hinterland states, regions with fertile agriculture, states close to powerful economies and major trade routes are geographically favored. On the other hand, for example, mountainous regions bring about high transportation costs (Sachs, 2000).

Moreover, Diamond (1997) questions the differences at the continental scales. He asks, why, Eurasia (He also uses this term to include North Africa) was more developed than Americas, Africa and Australia. His answer lies in the differences in the orientation of continents. According to Diamond (1997), orientation of continents affected the human progress, with varying spread rates of agricultural crops, livestock and innovations. The reason why spread was possible and fast lies in the western-eastern orientation of Eurasia, which provided localities at the same latitudes sharing similar climatic pattern (regimes of temperature and rainfall, and habitats) and similar day lengths seasonally. On the other hand, America and Africa's north-south orientation made such a spread very difficult, since such patterns change greatly as moving from north to south, or vice versa.

2.1.2.4. Flora and Livestock

Diamond (1997) argues that, continental diversifications do not end with the orientation differences. According to him, the progress was not only the outcome of pure geographical features, but also the products presented by geography. The first product is the domesticable plants and animals. Food production was indirectly a prerequisite for the development of the proximate factors like guns and steel. This would be possible by feeding non-food producing specialists. Availability of more calories meant more people. Animals also provided crucial opportunities for the development of societies. First of all, animals are the main source of the protein. Additionally big mammals served as sources of milk and milk products. They also increased the agricultural output by pulling plows. Another advantage some large mammals presented is that they provided main means of transportation. In a similar fashion, horses were used as military power to dominate other societies. It is clear then, how much important are the plant food and animals. However, only a very small portion of wild plants and animal species are useful, as most others are indigestible, poisonous, low in nutritional value, tedious to prepare, difficult to gather and dangerous to hunt.

For example, cereals and pulses which were abundant in Western Eurasia, adapted in a way to be most useful to people. They put most of the energy into the large seeds, by wasting little energy on making wood and fibrous stems. On the other hand, eastern Asia and New World’s rice and corn have lower protein contents compared to those of Fertile Crescent.

Eurasia's (including North Africa) Mediterranean zones had 32 crops, out of 56 with largest seeds. Out of 14 domesticated mammals in the whole World, 13 were confined to Eurasia (Diamond, 1997).

The starting point of human progress is very important to understand the underlying factors behind this progress. Diamond (1997) attracts to the Fertile Crescent, where has been the heart of human development. The answers lies in the wide range of altitudes and topographies within a relatively shorter distance covering all Fertile Crescent, resulting in high variations of environments; Mediterranean climatic zone with mountainous areas, lowlands with rivers, flood plains and deserts suitable for irrigation. This variation also led high diversity of crops. Again, in separate parts of the areas, the sheep, goat, pig and cow were domesticated. Since these species lived in areas close enough, they could spread all over the Fertile Crescent, providing it a clear advantage for food production.

In short, geographical means provided opportunities as well as constraints on the quality and quantity of human populations. By quality, nomadic-sedentary lifestyle, social stratification, political organization and innovativeness are referred. (Diamond, 1996) Hence, in Malthusian way of thinking, it determined the maximum size of the population. For the reviews of Diamond (1996), see Dawson (2002), Blaut (1999), Economist (1997), Begley (1997).

Geographical constraints are also emphasized by Harris (1971). It is assumed that most human populations depend on the carrying capacities of their territory, and that only few populations have ever risen all the way to the demographic ceiling imposed by energy input and output formula (Harris, 1971).

2.1.2.5. Critics of Geographical Determinism

As much as environmental determinism has been influential on the academy, it has been subject to criticisms. Frenkel (1992) indicates that, for a half century environmental determinism provided many students of society not only to geographers, a theoretical guide for generalizing about the world. However it is often treated as part of geography's distant and shameful past.

Environmental determinism generally suffered from being over simplistic. Likewise, Heider (1972) argues, according to its attackers, environmentalism demands a causality so direct, efficient and exclusive that it is easy to refute.

Landes (1998) criticizes geographical thought, which was much affected from the idea of environmental determinism. According to him, geography emits a sulfurous odor of heresy. Other intellectual disciplines have also propagated nonsense or excess, however no other has been so depreciated and disparaged.

Bassin (1992) quotes, Hartshorne (1939) claiming that environmentalism is a mere division of disciplinary focus away from geography's proper object of study: areal differentiation. Bassin (1992) also refers to Sauer (1962) considering environmentalism as a field of study which could do no more than leading a parasitic existence within the body of geographical science.

Many critics mainly arose because of the use of environmental determinism as a tool for imperialism. It has been argued that in its day, environmentalism represented nothing more or less than a thoroughly opportunistic attempt to explain and justify scientifically the abominations of the late nineteenth-century European imperial domination of the non-European world (Bassin, 1992). Examples include Panama (Frenkel, 1992), and Caribbean (Richardson, 1996) cases for which the scientific basis of environmental determinism provided an acceptable explanation and rationalization for imperialism.

Even a number of geographers who advanced environmentalist notions, such as Friedrich Ratzel or Halford Mackinder, were at the same time political actors with a major influence on colonial policy (Bassin, 1992).

This concept seemed to offer early-twentieth-century geographers a scientific foundation for theories by which it was possible to understand how people lived and acted in a changing world. Destiny of any society could be accordingly predicted by mapping isoterms and humidity. Although these ideas had lost much of their academic value; outside universities and colleges they retained considerable influence, perhaps a result of their apparent commonsensical nature (Frenkel, 1992).

Environmental determinism influenced in Panama on issues of labor, housing, social life, and justification for imperialism. Based on representations influenced from environmental determinism, policies were formulated, people subjugated, and places built. Environmental determinism provided policymakers and Canal Zone residents with an acceptable way to explain other more quarrelsome ideas (Frenkel, 1992).

2.1.3. Culture

"Geography is, no doubt, just one part of the puzzle. There are exceptions to the pure geographical explanations."

(Sachs, 2000)

Culture is used to refer to the entire way of life of society: its values, practices, symbols, institutions and human relationships (Huntington, 2000).

Harrison (2000) emphasizes on culture as a determinant of human progress and claims that underdevelopment is not caused by geographical conditions. Additionally, Harrison (2000) also shows there are exceptions in the tropical zone, where there are few developed countries, contrasting to geographically deterministic ideas.

Landes (2000) makes a similar conclusion with a different approach. He attracts attention to the minorities in many countries that achieve economic success compared to the other ethnicities, whose cultural structures are different. Sachs also asserts that certain social systems have supported modern economic growth, whereas others have not.

Landes (2000) points to the cultural notions that affect how a society approaches to a problem, are either in favor of economy or not. When things go wrong, people may ask two different questions. One is "what did we do wrong", and the other "who did us wrong". First question leads to another question "how do we put it right", and the second leads to conspiracy theories and paranoia (Landes, 2000). Grondona (2000) also attracts to cultural differences with respect to making choices related to economy: “When people’s investment yields outcome and they feel richer, they may be inclined to work less. On the other hand, consumption may increase, thus decreasing the surplus, so that development turns into enrichment.”

To what extend can culture explain human development? Porter (2000) indicates that the answer is not easy since interpreting culture’s role in the context of other influences and isolating the independent influence of culture is challenging, although the role of culture in economic progress is unquestioned. Approaches to culture in economic prosperity tend to focus on generic cultural attributes that are believed desirable, such as hard work, initiative, belief in the value of education, as well as factors drawn from macroeconomics, such as propensity to save and invest. These are absolutely relevant to prosperity, but none of these generic attributes is precisely correlated with economic progress. Hard work is important, but what guides and directs the type of work done is also at least important as that. Saving is good, but only if the savings are used in productive ways. Moreover, the same cultural attribute can have vastly different implications for economic progress in different societies, or even in the same society at different times. This makes evaluation of effects of culture even more difficult (Porter, 2000).

In addition, Landes (2000) also realizes that culture is not the only determinant explaining economic status. Complex processes like economy should have many invariably plural and interrelated determinants. Therefore, monocausal explanations will not work.

2.1.4. Culture also as Product of Geography?

It is widely accepted that, culture has an unquestionable role in explaining human progress (Weber 1905; Porter 2000; Landes 2000; Grondona 2000; Sachs 2000; Huntington 2000; Harrison, 2000). But, one may still wonder, why there are cultural differences among societies. One possible answer may lie in the environment factor, for what Diamond (1997) refers as the ultimate cause.

Harner (1970) suggests that food scarcity, measured by population pressure, is a major determinant of social evolution. Among agricultural societies, those with greater population pressure are more likely to have developed greater political complexity and integration, more class stratification, and to have shifted from unilineal to cognatic descent organization (Heider, 1972).

Heider (1972) uses Eskimos, Cree and Ojibway hunting groups, Mbuti pygmies examples social, demographic and economic patterns as the outcomes of environment in terms of natural harshness and food resources. In these cases however, quantitative techniques were not used. According to Heider (1972), in general, the environment plays a role in determining Marriage patterns, practice of female infanticide, population density and sizes of social units. He concludes that there is a complex systematic relationship in which the environment plays a role, although not a sole causal role.

The founder of cultural materialist school Harris (1968) states that the Darwinian strategy in the realm of sociocultural phenomena is the principle of techno-environmental and techno-economic determinism. According to this principle, similar technologies applied to similar environments tend to produce similar arrangements of labor in production and distribution, and these intermediate results produce similar kinds of social groupings, supported by similar systems of values and beliefs. Translated into research strategy, Harris' (1968) principle of techno-environmental and techno-economic determinism assigns priority to the study of the material conditions of sociocultural life, as much as the principle of natural selection assigns priority to the study of differential reproductive success (Harris, 1968).

Milton (1997) argues that, throughout much of its 100-year history, the discipline of ecological anthropology has been dominated by one simple idea that the features of human society and culture can be explained in terms of the environments in which they have developed. This leads to an understanding that environmental factors determine human social and cultural features. The power of this idea is easy to understand, presented at a time when biologists were enthusiastically embracing the insights generated by Darwinian theory. If biological diversity could be explained by environmental factors, then why cultural diversity could not be explained with the very same factors (Milton, 1997).

2.2. Conclusion and Remarks on Environment

Hawley (1950) states man's adaptive capacity is indeterminate, and he tends to preserve and expand life to the full extend permitted by environmental limitations. Bassin (1992) similarly concludes that care must be taken to avoid falling back upon on overly rigid reductionist analysis referring the man and environment relationship. Going even further, Murdock and Albrecht (1998) argue that humans are capable of developing technologies that enable them to manipulate their environment. Such arguments may reach to a point that the environment has not any affect on human societies anymore. However, such approaches are very optimistic as Harris (1971) criticizes. He asserts that, in industrial societies, the influence of environment, in the short run, appears to be subordinate to the influence exerted by prior modes of production and by demographic, political, and ideological factors. This statement must be carefully distinguished from the often repeated but dangerously incorrect belief that industrial societies have liberated themselves from the influence of the environment, and therefore the interaction between technology and environment can no longer account for cultural differences and similarities. It is true that replicas of cities can be built in deserts or even on the moon. However, energy and materials used by humans are limited and irreplaceable. In addition to extinction of resources, environmental degradation is also another fact, that is and will be putting restraints upon production, social structure and other aspects of culture (Harris, 1971).

Both the environment and man are very complex entities; therefore the relationship between them is even more complex. However, no matter how complex this relationship, as Sack (1993) argues, people and objects interact in space and there could be laws of behavior which govern these interactions. This argument constitutes the ideal basis for this thesis. The aim of this thesis may be seen as a reflection of the idea of environmental determinism, for the search of geographical causation. But it is also frequently mentioned that, the study is built on the acceptation of the power of many influences (like culture), other than environment. The actual aim is therefore, to seek only for the effect of the environment among all other factors.

2.3. The Proper Way of Studying Environment

Generally the arguments made concerning human progress were made at the micro scales (Diamond 1997; Landes 1998) making the problem more difficult to grasp. That is, it has been tried to explain the progress and status of societies altogether; how they interacted, progressed, evolved, advanced and dominated others.

Complexity of the phenomenon gives rise to one problem. How can other variables controlling the development be controlled, so that the influence of environment can be observed? One of the reasons that the debate over environmental determinism does not end is that, the observations are made on the global scale. As getting far from the local scale to regional or even global, other factors (which are evaluated as proximate factors by Diamond, 1997) may become to be more effective and involved compared to the environment. Although these factors may be regarded as the products of environment as the ultimate cause, it is not easy to clearly define what these are, and how much effect do they have. It is also not possible to quantify them.

Heider (1972) makes considerations about when the environment's effect on development could be observed. According to him, if one is dealing with a system of multiple variables, one must pick societies as much alike as possible in order to control for as many variables as possible. (Heider, 1972) Likewise, it will be unsound to compare completely different societies since culture itself is an independent variable with high influence.

By carefully selecting the societies to be compared, some variables can be controlled and the workings of the system better seen. The model for contrastive comparison uses closely related, culturally similar groups which live in slightly different environments to show that the slight environmental differences cause differences in their social patterns. The assumption therefore is that formerly the two groups were similar and that any present differences can be accounted for by differential adaptation to the environments (Heider, 1972).

That is why; if the environment is being studied, the factors other than environment should be close to each other. (Low cultural variability, high environmental variability) This enforces the method of comparison of the societies which are similar in their intrinsic features, which are culture, technology level and ethnical structure. Therefore, such a relationship should be inquired at smaller scales, since there are many factors influencing the development other than environment.

CHAPTER III

THEORETICAL BASIS FOR SPATIAL DATA ANALYSIS

3.1. GIS and Spatial Data Analysis

The classical GIS functions alone are not sufficient for all types of spatial analysis. According to Bailey and Gatrell (1995), the GIS can for example is able to perform "point in polygon" operations so that the number of points for each polygon can be calculated. However, it is hard to find a system which evaluates statistically the nature of the association between the set of points and the set of polygons.

Therefore, when it is about investigation of a relationship between different phenomenons, spatial statistical analysis techniques take place. According to Bailey and Gatrell (1995), there are several ways to couple GIS and spatial analysis. The first one is full integration, which implies that spatial analytical functionality is embedded in GIS. An alternative to this is the loose coupling between GIS software and other software used for spatial analysis. This alternative suggests exporting the data obtained by GIS into a statistical spatial analysis framework. Another approach is the close coupling, which involves calling a spatial analysis routine from within the GIS. One other choice is developing a user made self-contained spatial analysis system. The last option is integration of spatial analysis systems and limited GIS functions into statistical analysis systems. In this thesis, several ways were used as. For some analyses (like Spatial Moving Averages and Geographically Weighted Regression) loose coupling method was used, that is; the data was exported from GIS to other programs to execute analyses. Sometimes routines were written and executed on this data when needed. When analyses were finished, the data was imported back to GIS to display the information created. Close coupling method was also used, as in the spatial regression implementation case. In this case, the S+Spatial Stats (v.1.1) module within Splus Statistics (v.6.2) software package was called via an extension written for Arcview GIS (v.3.2).

3.2. Analysis of Area Data

The main data unit, on which all the analyses were carried out, is of area. Area data implies that the data is composed of closed zones, for which the attributes remain over each area. There can be either regular lattices, or irregular areal units. As for this thesis, the case study is made up from irregular areal data, and the areal units are the villages.

The major steps of analyzing the area data is presented in the preceding sections in three steps: visualization, exploration and modeling, all of which are necessary for a comprehensive data analysis. They are in fact, pieces of a whole, completing each other. In summary, visualization provides a glance over the data. Local analyses, which are made through exploration, are also important for hypothesis generation as provide a deeper insight about the data. Finally modeling phase is implemented to justify the relationships, which are thought to be existed according to visualization and exploration steps.

3.2.1. Visualization

In order to visualize the data, it should be presented in a proper way. The GIS is the main tool for displaying the spatial data. There are different ways to represent one or more attributes of the same area data, as for the traditional cartography. One of those methods is the use of proportional symbols placed inside each area, for a selected attribute. Size of the symbol, which is generally a basic geometric shape, represents the value that attribute. Colorization can be applied, if another attribute value is to be visualized at the same time. In this case, use of different colors and shading provide representation of the value of the second attribute (Bailey and Gatrell, 1995).

A common choice for area representation is the choropleth mapping. For that, each of the areas are colored or shaded according to the attribute to be displayed. In this case, there will be a certain number of different colors or shades to be used. This amount is chosen by the user. At this step, Bailey and Gatrell (1995) warn that, different choices for choropleth mapping can lead the user make different interpretations from the very same data. Moreover, the size of the areal units makes the interpretation inefficient, as the larger areas tend to dominate the whole map.

A solution for large area dominance is the density equalized map or cartogram mapping. This approach suggests transforming each areal unit to make its area proportional to the attribute value, while at the same time maintaining the spatial contiguity of the zones. In other words, the attribute to be represented in an areal unit is normalized by its area (Bailey and Gatrell, 1995).

There is a problem named Modifiable Areal Unit Problem, associated with the use of areal data (Bailey and Gatrell, 1995). This problem emerges if the boundaries of areal units are drawn by administrative authorities, and therefore it is actually possible to redraw those boundaries in a different way.

3.2.2. Exploration

Exploration provides necessary insights about the data to be analyzed as a prior step to the modeling. The outcome of exploration step will be again in the form of a map, like visualization. However, when the data is explored, manipulations to some degree are made, resulting in new maps with new data generated from some older data. By removing the extreme high and low values (outliers), such maps will indicate the general trends throughout the area. Bailey and Gatrell (1995) argue that exploration involves a significant degree of ‘value-added’ data manipulation.

Spatial data exploration is either concerned with first order or second order effects. First order effects refer to the global scale, and relate to the change in the mean value of the process in the area. Second order effects relate to the interaction and dependence between the spatial elements, which is stronger for the closer elements. Thus, second order effects are at local scale. The term “autocorrelation” emerged due to the fact that spatially close elements happen to reflect similar attributes (Bailey and Gatrell, 1995).

3.2.2.1. Stationary and Isotropic Spatial Processes

Stationary and isotropic processes are the necessary concepts to make assumptions for the explorative analyses. The second order component is modeled as a stationary spatial process, referring the condition that the process' statistical properties are independent of absolute location in the area. It implies that the mean and variance are constant throughout the whole area, and therefore not dependent on the location. It also implies that the covariance between two sites depends on only the relative locations of those sites, the distance and direction between them, and not on their absolute location.

A spatial process is isotropic, provided that it is also stationary and the covariance depends only on the distance between the two sites, excluding the direction in which they are separated.

3.2.2.2. Proximity Measures with Area Data

There are techniques for both exploring the first and the second order effects. It is important to measure the distance or spatial relation between them, so that making manipulations regarding those spatial dependencies will be possible. Exploration cannot be done without the integration of spatial relationships. This integration of relations is achieved through the use of proximity measures among the spatial units. Proximity measures are too, an indispensable part of the modeling step. Therefore, in order to include the spatial dimension of the data, it is necessary to embed the spatial relationships between elements.

Distance matrices are used for this purpose. A distance matrix includes for all spatial units' distance information with each other. The distance information between the unit i and j is symbolized as w_{ij}.

Bailey and Gatrell (1995) state that, in the case of a continuously varying attribute over a study area, it is natural to use distance between point locations as the basis for measuring spatial proximity. In the case of area data, defining the spatial proximity measures between each of the areas is necessary. There are a number of choices to do this:

w_{ij} = 1 if centroid of A_j is one of the k nearest centroids to that of A_i
= 0 Otherwise

w_{ij} = 1 if centroid of A_j is within some specified distance of that of A_i
= 0 Otherwise

w_{ij} = d_{ij}^{γ} if inter-centroid distance $d_{ij} < \delta$ ($\delta > 0$; $\gamma < 0$)
= 0 Otherwise

w_{ij} = 1 A_j shares a common boundary with A_i
= 0 Otherwise

w_{ij} = l_{ij} / l_i where l_i is the length of common boundary between A_i and A_j and l_i is the perimeter of A_i

w_{ij} is the distance between the elements i and j. δ is the threshold, A_i and A_j are the areal units. These alternatives are not the only ones to be the used. Additionally, modified versions of these proximity measures can be used.

3.2.2.3. Exploration by Spatial Moving Averages

Spatial Moving Averages technique is used for exploring the first order effects. It refers smoothing out the attribute values of the areal units according to their spatial proximity. The resultant map is an indicator of how the mean value of the chosen attribute varies over the space. In other words, it shows the major trends by smoothing the extreme values. To implement this, first a suitable proximity measure determination technique is selected, and then each areal unit's new attribute value is calculated with the influence of its neighbors defined in the selected proximity matrix.

3.2.2.4. Exploration by Autocorrelation

Autocorrelation measures are used for exploring the second order effects.

This section aims to briefly explain the spatial dependence of deviations in attribute values from their mean. Most commonly used techniques try to estimate spatial correlation rather than covariance. The term spatial autocorrelation, rather than just spatial correlation, is used to refer this spatial correlation, since it involves the correlation between values of the same variable at different spatial locations (Bailey and Gatrell, 1995).

Two of mostly used autocorrelation measures are Moran's I and Geary's C, calculation of which are shown by equation 3.1 and 3.2. By the generalization of I or C to estimate spatial correlation at different spatial lags, correlograms can be produced.

$$I = \frac{n \sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij} \left(y_i - \overline{y}\right)\left(y_j - \overline{y}\right)}{\left(\sum_{i=1}^{n} \left(y_i - \overline{y}\right)^2\right)\left(\sum_{i \neq j} \sum w_{ij}\right)} \qquad 3.1$$

$$C = \frac{(n-1) \sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij} \left(y_i - y_j\right)^2}{2\left(\sum_{i=1}^{n} \left(y_i - \overline{y}\right)^2\right)\left(\sum_{i \neq j} \sum w_{ij}\right)} \qquad 3.2$$

where n is the total number of spatial units, W is the proximity matrix and $\bar{y}$ denotes mean observed value (Bailey and Gatrell, 1995). Moran's I, for most of the cases, has a mean value of -1 / (n-1) where n is the number of units. If the mean value is exceeded, it is an indication of positive spatial autocorrelation. If the Moran's I statistic is below the mean, which means there is a negative spatial autocorrelation. A positive autocorrelation is observed, when the Geary's C statistic ranges between 0 and 1. The C statistics larger than 1 indicate a negative autocorrelation (Kaluzny et al, 1998).

3.2.2.5. Exploration by Geographically Weighted Regression

Conventional spatial analysis methods have been applied at a 'global' level, meaning that one set of results is generated from the analysis. These results are assumed to apply equally across the study region. It is rarely acknowledged that what is being undertaken in a global analysis is the generation of an 'average' set of results from the data. If the relationships are being examined vary across the region, the global results will have limited application to any particular part of that region, and therefore may not represent the actual situation in any part of the whole study area. In a global analysis, there is no information on whether there is any substantial spatial variation in the relationships being examined, any such information is lost in the analysis (Fotheringham et al, 2000).

Fotheringham et al (2000) show that the power of local analysis emerges where the global analyses fail. In local analysis, the focus of attention is made on testing for the presence of differences across space rather than on ignoring these differences. “The movement encompasses the dissection of global statistics into their local constituents; the concentration on local exceptions rather than the search for global regularities.” (Fotheringham et al, 2000).

In GWR, a technique of local explatory data analysis

$$y_i = a_0(u_i,v_i) + \Sigma_k a_k(u_i,v_i)x_{ik} + \varepsilon_i \qquad 3.3$$

where y_i represents the vector of observations on the dependent variable at the point i. (u_i,v_i) denotes the coordinates of the ith point in the space and $a_k(u_i,v_i)$ is a realization of the continuous function $a_k(u,v)$ at point i. In the calibration of the GWR model, observed data near to point I have more influence in the estimation of the $a_k(u_i,v_i)$ than do data located farther from i. In essence, the equation measures the relationships that exist in the model around each point i. In GWR an observation is weighted according to its proximity to point i so that the weighting of an observation is no longer constant in the calibration but varies with i. Therefore, data from observations close to i are weighted more than the data from observations farther away (Fotheringham et al, 2000).

Algebraicly, GWR estimator is predicted as

$$a_k(u_i,v_i) = (X^T W(u_i,v_i)X)^{-1}X^T W(u_i,v_i)y \qquad 3.4$$

where $W(u_i,v_i)$ is an n by n matrix whose off-diagonal elements are zero and whose diagonal elements are the geographical weighting of observed data for point i. GWR therefore can produce localized versions of all standard regression diagnostics including goodness-of-fit measures such as R^2 (Fotheringham et al, 2000).

If all the weights are given 1 in the weight matrix that will mean there is no spatial variation in the data and hence will produce the same results as global non-spatial regression does. Similarly, the higher the bandwidth is set in a distance-decay function of $w_{ij}= \exp(-d_{ij}^2/h^2)$, the more similar will the results be with the global regression. Or, the larger is the d value in

$w_{ij} = 1$ if $d_{ij} \leq d$

$w_{ij} = 0$ otherwise

weighting function, the closer parameters to the global regression. Conversely, as the bandwidth becomes smaller, the parameter estimates will more depend on observations in close proximity to i, and hence will have higher variance. Therefore, the problem is therefore how to select an appropriate kernel and an appropriate bandwidth for that kernel (Fotheringham et al, 2000).

In many cases, spatial weighting function is applied equally at each calibration point. However such an approach suffers from the potential problem that in some parts of the region, where data are sparse, the local regression might be based on relatively few data points. To avoid this potential problem, spatially adaptive weighting functions can be adapted into GWR. These would have relatively smaller bandwidths in areas where data points are intensely distributed and relatively large bandwidths in areas where the data points are sparsely distributed (Fotheringham et al, 2000).

3.2.3. Modeling

Visualization and exploration will not be just enough when the researcher want to find relationships within the spatially interacting data. At this point, statistical modeling techniques should be applied to justify the hypothesis developed during the exploration step. Non-spatial and spatial regression models are examined in the preceding sections. It should be noted that these models are predictive, whereas GWR is not.

3.3.3.1. Non-Spatial Regression Model

A regression model embodies a relationship in the form of a dependent variable and independent variable(s). Accordingly, dependent variable is supposed to be at least in part controlled by the independent variable(s).

$$Y = a_1 + a_2X_1 + a_3X_2 + \ldots \qquad 3.5$$

where Y is the dependent and X's are the independent variables (Walford, 1995).

3.2.3.2. Spatial Regression Model

The conventional regression was seen inadequate for geographic research as it lacks the spatial dimensionality (Fotheringham et al, 2000).

By a more recent method called spatial regression, spatial lattices are modeled by taking two levels of variation are taken into consideration: global scale variations in the mean value due to spatial location or other variables, and local variations due to interactions with neighbors (Kaluzny et al., 1998).

The spatial regression model takes the form

$$Z_i = \mu_i + \delta \qquad 3.6$$

Where Z_i is the random process at the site i; μ_i is the mean value at the I, which may be constant or a linear model with covariates; - $\delta \sim N(0,\Sigma)$; and Σ is the covariance matrix of random variables at all sites. Non-constant μ can be modeled as a linear model within the spatial modeling framework. The small-scale variation is modeled by fitting an autoregressive or moving average covariance model to Σ (Kaluzny et al., 1998).

When predicting a dependent variable over a space, for each zone, this variables' value of spatial neighbors should be used as an explanatory variable. Therefore, the dependent variable needs to be transformed into a vector of neighbor weighted sum (Fotheringham et al., 2000).

The regression takes the form in equation 3.7, when neighbor weighted variable Wy is added to the equation.

$$y = X\beta + \rho Wy + \varepsilon \qquad 3.7$$

The value of Wy depends on the proximate measure w_{ij} used. ρ is the regression coefficient for neighbor weighted variable (Fotheringham et al, 2000).

There are three choices for covariance structures, which are conditional spatial autoregression (CAR), simultaneous spatial autoregression (SAR), and moving average (MA) models. These models assume that there is multivariate normality, with the differences lying in the choice of dispersion matrix (Kaluzny et al., 1998).

CAR: $\Sigma = (I - \rho N)^{-1} D\sigma^2$ 3.8

SAR: $\Sigma = [(I - \rho N)^T D^{-1} (I - \rho N)]^{-1} \sigma^2$ 3.9

MA: $\Sigma = (I + \rho N) D (I + \rho N)^T \sigma^2$ 3.10

where ρ and σ are scalar parameters which are estimated by the model. N represents the weighted neighbor matrix, and D represents the diagonal matrix used to measure non-homogeneous variance of the marginal distributions (Kaluzny et al, 1998).

CHAPTER IV

FRAMEWORK OF DEVELOPED METHODOLOGY

4.1. Description of the Data and Methodology

The data for this study include graphical and non-graphical (tabular) data. The non-graphical portion of the data was in the form of a table. This tabular data includes 195 variables, which is in the form of a database. This data were acquired as a rural survey made by State Rural Works, consisting of a very wide range such as the number of vehicles, agricultural production, livestock information and so forth. (See Appendix B to see the list of variables) The whole data were used to extract a single socioeconomic status index.

The graphical data include village boundary and soil capability polygons (in vector data model) and Digital Elevation Model (in raster data model). It is important to note that the settlements were represented by area units, and all the analyses were executed using these area units. In other words, it is the polygons that were used as the main data structure in Geographic Information Systems (GIS). Accordingly, in order to investigate the relationship between socioeconomic structure and environmental parameters, first, the socio-economic index and the environmental parameters were attached to these area units.

Briefly, the relationship was investigated with a simple approach. Among many environmental parameters, only the ones related to topography and soil capacity were used. Environmental parameters relating to climate and biodiversity could not be integrated to the analysis because the related data were not available and difficult to quantify.

The most crucial tool for investigating this relationship was the spatial data analysis using GIS and spatial statistical techniques. The simplified methodology is shown by a flowchart (Figure 4.1). This chapter includes Part 1 and Part 2. Part 3 is implemented in Chapter V.

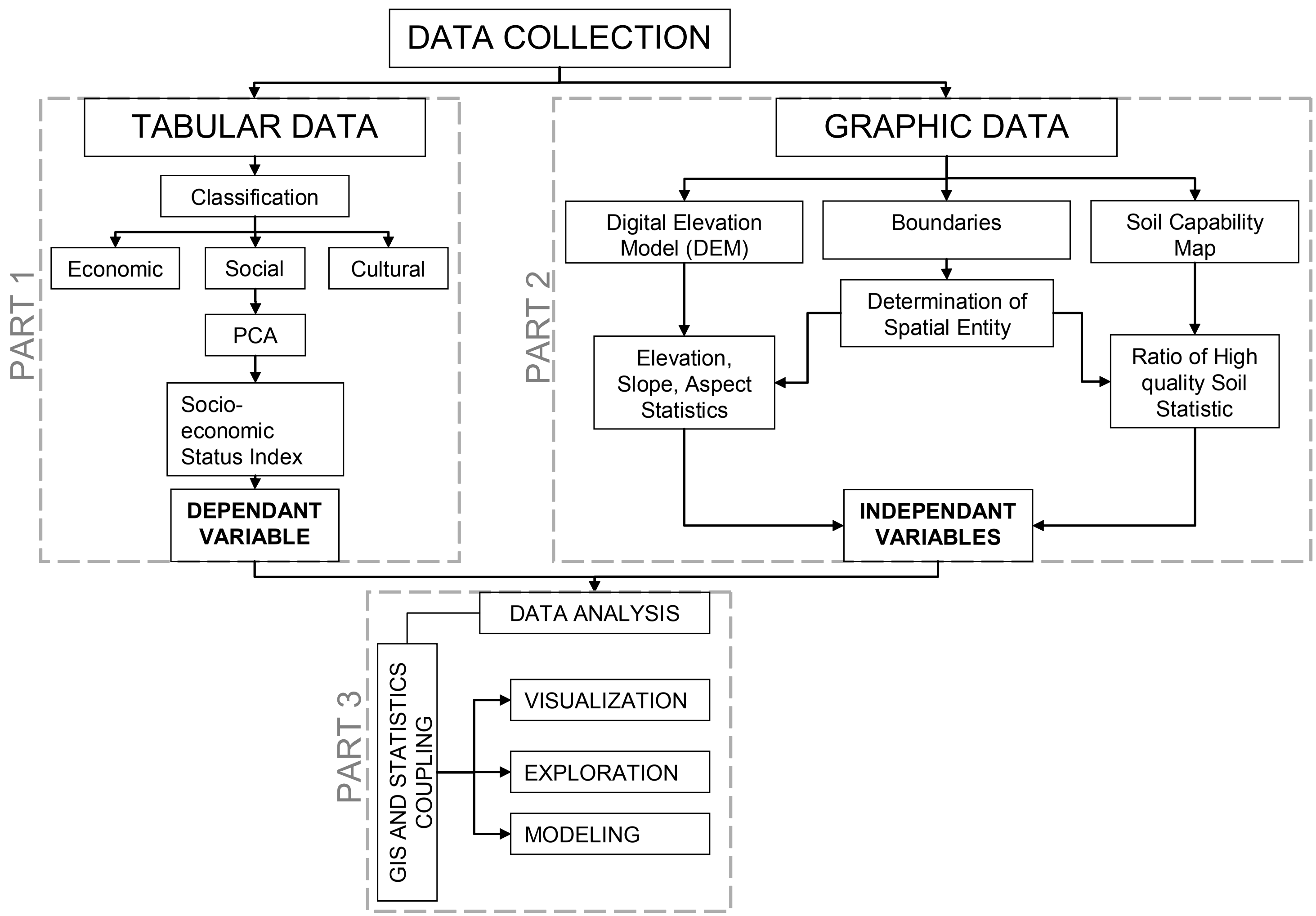

Figure 4.1. A simple flowchart showing the methodology used in this study

4.2. Socio-Economic Status

4.2.1. Definition

Socio-Economic development has been traditionally related to economic developments and activities. However, such an understanding leads omitting some certain dimensions of a society. On the other hand, the concept of development not only refers to physical capacity size and economic income, but also their interregional distribution, and social and cultural characteristics. In other words, it derives its content from all aspects of society (DPT, 1998).

Social factors like size of the traditional agricultural sector, urbanization, and character of social organization, literacy, cultural and ethnic homogeneity, fertility rate are important factors explaining the socioeconomic status (Adelman and Morris, 1967).

4.2.2. Index Determination Using Indicators for Socio-Economic Status

There are several ways to determine an index about a group of populations. Many of them are expertise oriented. Rummel (1972) indicates that different people often use different measures, and these measures are not clear apart from what they were intended to mean. Therefore, there isn't a universally accepted set of indicators to create the most efficient measure. For example, Shevky and Bell's Social Area Analysis (1955) and Factorial Ecology by Murdie (1969) suggest selection of particular variables and construction of an index by multiplication of them with predefined weights.

Grove (1996) quotes Burch (1978) noting that, the procedure for inventorying a human habitat is similar to other ecological analyses of large animals. One usually counts a variety of things like size and structure of population, fecundity, fertility, territory, hierarchy, social change, organization of the breeding and socializing unit, and so forth. Simple measures of the human community which are most readily available and superior in accuracy to similar measures made in the field studies of other animals.

Similarly, social scientists have developed social indicators approaches (Burch 1978; Burch and DeLuca 1984; Machlis et al. 1994), social area analyses (Shevky and Bell 1955; Frisbie and Kasarda 1988) and factorial ecology approaches (Johnston 1976, Murdie 1976) for differentiating and categorizing human societies (Grove, 1996).

Shevky and Bell (1955) used U.S. census data (social indicators) and census tracts (social areas) to develop a set of social area indices (classification) to measure these concepts individually and in combination. The four indices included 1) a socioeconomic index (income and education), 2) a household index (homeownership, single-family dwellings and married households), 3) an ethnicity index (race and foreign-born residents), and 4) a social area index (a composite of the first three index). These indices were also named as: Social Rank, urbanization, and segregation or, economic status, family status and ethnic status (Murdie, 1969; Grove, 1996). Social Area Analysis demanded selection of census tracts related to possible measures of these constructs. This technique has been applied to a number of cities, primarily within the U.S., often in conjunction with studies of such topics as crime, voting behavior, and the demand for intra-urban transportation (Murdie, 1969).

In fine, social area analysis indicates how family characteristics, economic status and ethnic background produce a certain spatial pattern within an urban area (Ananthakrishnan, 1998). However, Ananthakrishnan (1998) discusses, social area analysis as applied in U.S. can not be naively adapted to the study of his Indian case. Therefore it is open to the question if such a methodology is universally acceptable.

4.2.3. Use of Principle Components Analysis (PCA)

The social area analysis may be done statistically by a principle components analysis (Ananthakrishnan, 1998). Similarly, other studies based on index determination (DPT 1998; Debroy and Indicus Analytics 2002; Australian Bureau of Statistics 1998) use PCA.

With PCA a large number of independent variables can be systematically reduced to smaller, conceptually more consistent set of variables which are a linear combination of the original variables. The smaller set of uncorrelated components represents most of the information in the original set of variables. Since the principal components are uncorrelated, each one makes an independent distribution to accounting for the variance of original variables (Dunteman, 1989).

In PCA, it is very important to decide how many components to select. One approach is to retain components until reaching Jollifle's (1986) criteria of λ (total variance explained) = .70 starting from the first component (Dunteman, 1989).

One problem with the PCA is that, in the case that the variables have less correlation among each other especially when there are too many variables, then the variance explained by the first components would be relatively lower. In order to increase the variance explained by fewer components, Dunteman (1989) suggests using the discarded principal components to discard variables. The process starts with the smallest discarded component and by deleting the variable with the largest weight or loading on that component. Then the variable with the largest loading on the second smallest component would be discarded. If the variable had been previously discarded, then the variable with the next highest loading would be discarded. This procedure continues up through the largest discarded component. The rationale for deleting variables with high weights on small components is that small components reflect redundancies among the variables with high weights. Another way to look at it is that components with small variances are unimportant and therefore variables that load highly on them are likewise unimportant.

4.2.4. Application of PCA for Index Determination

Social area analysis methods also adopted data reduction methods.

Murdie (1976) clearly puts why such methods work well for socioeconomic stratification studies. In most instances, characteristics are not chosen with the aim of specifically replicating the social area indices, but rather, of isolating those dimensions which explain as much as possible of the socioeconomic differentiation. Principle components analysis is a multivariate statistical tool to make this possible, by eliminating redundancies within an inter-correlation matrix of census characteristics.

Murdie (1976) used fifty-six variables for the analysis of change between 1951 and 1961 for Toronto. The analysis resulted in producing six factors (Economic Status, Family Status, Ethnic Status, Recent growth, household and employment characteristics) explaining around 75% for both years. These factors were mapped and their association with each other was examined.

In order to extract an index indicating the rank of the cities relating to their capacity for business a study has been made in India by Debroy and Indicus Analytics (2002) . First, all the data (25 variables) were grouped under six different categories (professional education, road transport, communication, private finance, tourism, growth of economy) for 36 cities in India. Three to five variables were used for each category. PCA was implemented for each group, and each first component explaining the greatest amount of variance within each group was used to calculate the overall index. This composite index was calculated as the equal weighted average of those first components (Debroy and Indicus Analytics, 2002).

A study made by DPT included 58 variables to extract a single index indicating the socio-economic development level of 80 cities in Turkey. These variables were either normalized by the population or areal size of each city. All these variables were categorized under; social (included demographic, employment, education, health and infrastructure indicators), economic (included industry, building sector, agriculture and financial indicators) (DPT, 1998).

Another study made by Australian Bureau of Statistics included 27,000 Census Collection Districts throughout Australia. Data were normalized by population of each district.

In order to reduce the dimensionality of 58 variables in Turkey and 44 variables in Australian case, PCA was used. Both studies made by DPT and Australian Bureau of Statistics selected the first component. The first component accounted for 53.79% of variance in DPT's study, 17.8% for the latter. (DPT, 1998; Australian Bureau of Statistics, 1998)

The Dimensionality of Nations project aimed to delineate the dimensions of 82 countries with 236 variables. 15 components (76.8%) with the first three explaining 52.8% or variance were extracted using PCA. These three components were as named economic development, size and political orientation indices (Rummel, 1972).

PCA can also be integrated to social area analysis, for finding each dimension; economic status, family status and ethnic status (Grove, 1996; Ananthakrishnan, 1998).

4.2.5. Socio-Economic Parameters for Çankırı

The data were collected from a rural survey made in 1980 by General Directiore of Rural Services. The data were in survey booklets (see Appendix A) for each settlement. Unfortunately, altough there were over 500 villages in Çankırı region, only data of 331 were available, since the other survey booklets were missing. At first, 300 variables from these booklets for each village were inputted to a database. Afterwards, 195 variables (see Appendix B) were selected among the set of 300, some of which were hence eliminated. The selection criteria were mainly focused on whether a variable reflected any socio-economic dimensionality. The index determination process is explained in the Chapter III.

4.3. Graphical Data

4.3.1. Boundary Extraction

The village boundaries were digitized by TNT Mips using 1/25000 maps. The map was produced as a polygon vector map as shown by Figure 3.2. The program automatically generated a primary key for each polygon unit, which denoted each village uniquely and would be used as a labeling key for all joining operations.

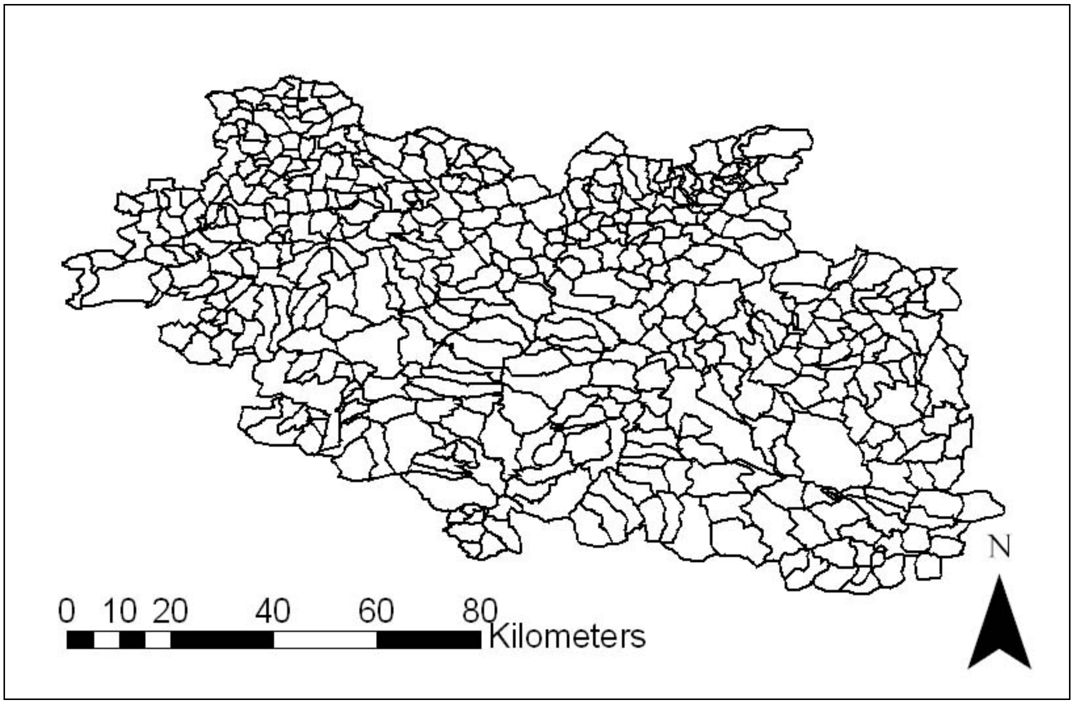

Figure 4.2. Village Boundaries

4.3.2. Natural-Environmental Parameters

4.3.2.1. Natural and Geographic Structure of Çankırı

90% of the whole area is covered by mountains and plateaus. Since most of the area was bare land, it suffered severe erosions. More than 60% of the region is covered by high mountains. The highest hills also form the northern boundary of the region. Kızılırmak which is the longest river, has a 30 km part inside the region. Streams tend to flow among sharp and narrow valleys (Çankırı İli Arazi Varlığı, 1998).

Middle Anatolian continental climate dominates the Çankırı region. Therefore, summers are hot and droughty, winters are cold and harsh. Central township has an annual temperature average of 11.5^0 (Celsius).

The average precipitation which differs between years is observed as 397.2mm in 1975. The average of total snowy days is 14.8, and 22.8 days is covered with snow. On the average, 92.7 days are clear, 194.5 days are cloudy and 78 days are covered. The climatic conditions considerably differ over the region as shown by the differences between central and Çerkeş townships in Table 4.1 (Çankırı İli Arazi Varlığı, 1998).

Table 4.1. Some climatic differences between Central and Çerkeş townships of Çankırı (source: Çankırı İli Arazi Varlığı, 1998)

	Merkez Township	**Çerkeş**
Annual Mean Temperature (^{0}C)	11,5	8,2
Highest Temperature (^{0}C)	41,8	35,3
Lowest Temperature (^{0}C)	-25,0	-26,7
Mean Clear Days	92,7	57,2
Mean Cloudy Days	194,5	176,8
Mean Covered Days	78,0	131,2
Mean Precipitation (mm)	397,2	380,5
Mean Snowy Days	14,8	23,5
Mean Snow Covered Days	22,8	46,3
Maximum Thickness of Snow Cover (cm)	58,0	41,0
Mean Foggy Days	13,5	26,3
Mean Frosty Days	53,6	68,5
Mean Wind Speed (m/s)	1,6	2,4

The variability of vegetation decreases as moving from north to south. Although almost the whole region was covered by forests 3 centuries ago, the area was deforested because of unfavorable climatic conditions, forest fires, and wood-cutting (Çankırı İli Arazi Varlığı, 1998).

There is variety of soil groups resulted from climate, topography and material conditions. There are eight classes of land, which differ in their capabilities of agricultural production. They occupy, from the highest capable to the lowest; 55115 ha – 6.5%, 62655 ha – 7.4%, 81627 ha – 9.6%, 84257 ha – 10%, 44 ha – 0.005%, 130087 ha – 15.4%, 418039 ha – 49.5%, 13287 ha – 1.6% of the whole region. (Also see Table 3.2) The first four classes are accepted as lands which are suitable for soil processing agriculture. Fifth, sixth and seventh classes are not suitable for soil processing agriculture. Eighth class is not suitable for agriculture at all (Çankırı İli Arazi Varlığı, 1998).

Table 4.2. Area and percentage distributions of soil capability classes over Çankırı (Source: Çankırı İli Arazi Varlığı, 1998)

Soil Capability Class	Total Area (ha)	Percentage in Total
I	55115 ha	6.5%
II	62655 ha	7.4%
III	81627 ha	9.6%
IV	84257 ha	10%
V	44 ha	0.005%
VI	130087 ha	15.4%
VII	418039 ha	49.5%
VIII	13287 ha	1.6%

In Çankırı, some villagers exploit the land on their own, while some others acquire financial aid by credits from the government. Mostly wheat and some other cereals are produced as the main crops. Unfortunately, some villagers harmed the agricultural capacity of the region by;

1. Increasing the risk of erosion due to the wrong soil management in the sloping areas.
2. Increasing the problem of drainage and drought due to wrong means of irrigation.
3. Opening new agricultural fields by clearing out forests, pastures and shrubbery lands.
4. Abandoning the lands they made infertile due to erosion they caused to (Çankırı İli Arazi Varlığı, 1998).

4.3.2.2. Selected Environmental Parameters

Only parameters related to topography and soil capability were used most importantly because of availability and simplicity issues. In Chapter II, other variables like climate and natural resources (water, precious minerals) were especially emphasized, for their crucial role in affecting the human progress. These data, however, were not available, and if available not accurate to be evaluated for each village. The precipitation and temperature for example are only available for a few point locations, which are not sufficient to provide statistics throughout the whole region.

In addition to a Digital Elevation Model (DEM) with 90 meters spatial resolution of the area, slope and aspect maps were produced by using the same DEM in TNT Mips 6.4.

Elevation of the region ranges from 400 to 2400 m in the study area. (See Figure 4.3.)

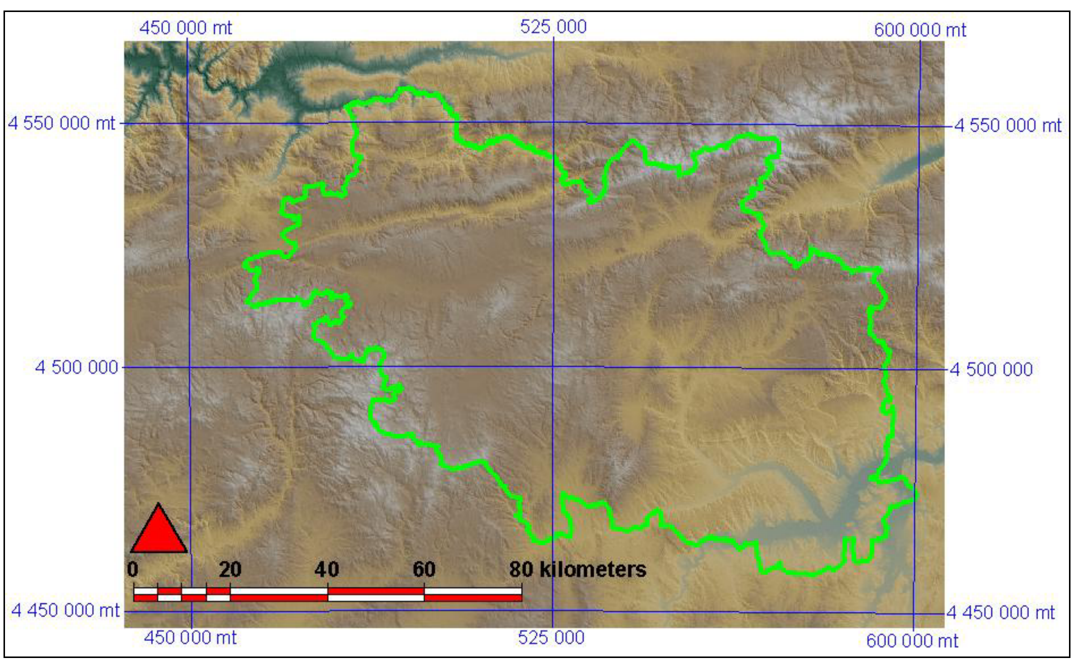

Figure 4.3. Elevation Map

Slope amount changes from 0 to 57 degrees in the study area. (See Figure 5.4.) Southeastern part of the study area is dominated by very gentle slope.

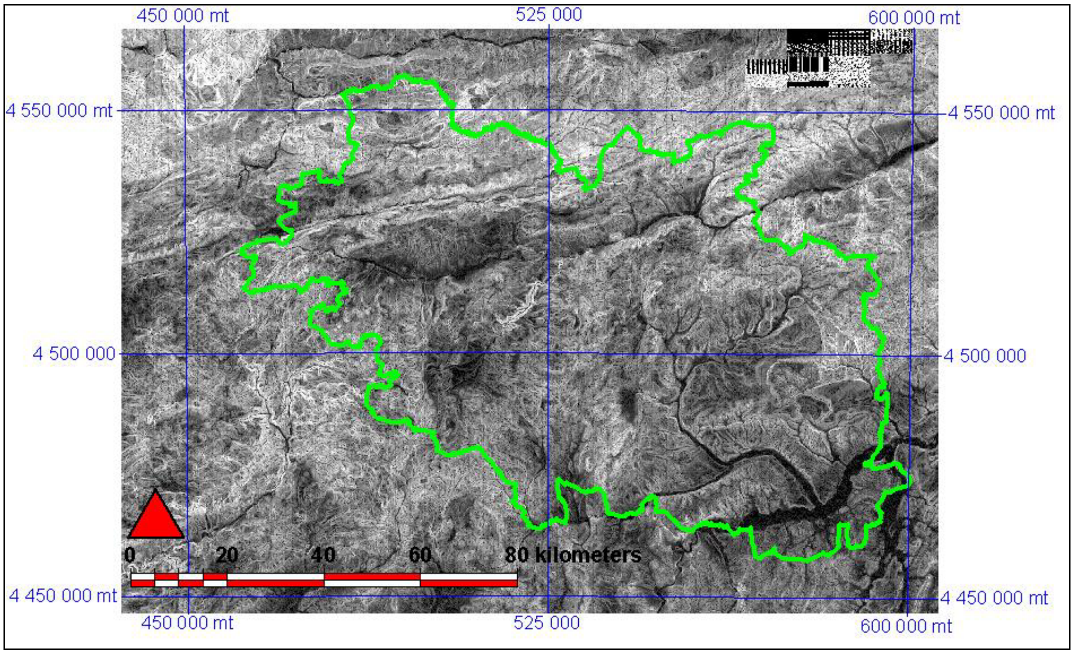

Figure 4.4. Slope Map

Aspect values ranged between -1 and 240, with -1 representing flat surfaces, 0 and 240 indicating north direction and 120 indicating south direction, as seen in Figure 3.5. Aspect map was reclassified for the further stages of the study to see if there is any positive effect of northern looking slopes on socio-economic status, rather than southern looking slopes, or vice versa.

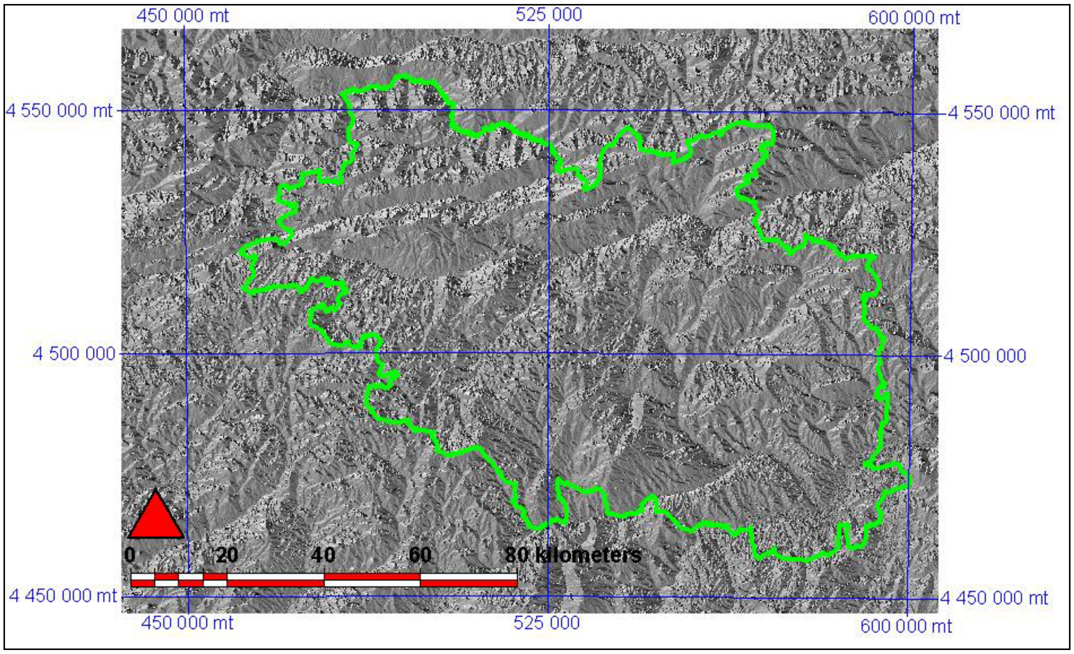

Figure 4.5. Aspect Map

Therefore, the aspect values were transformed in a way that, the northern looking pixels took smaller, and southern looking pixels larger values. To implement this, in the geoformula applied (see the script written for this study in Appendix G), the values between 0 and 120 were divided by 12. The values between 120 and 240 were first subtracted from 240, and then divided by again 12. Therefore all the pixel values were transformed into new values which are 10 in the most south, and 0 in the most north, as seen in Figure 1.4. Lastly, the flat surfaces, which had the value of -1, were given the value of 10.

There are two main reasons for this operation. First of all, the aspect information should be in a form which is suitable for quantifying each village for the analysis part. However, at their initial condition, both extreme values 0 and 240 almost represent the same direction. Therefore, the information should be transformed according to one orientation.

The answer to why this transformation was made according to a north-south axis is that, at the symmetrical points of this axis, both western and eastern pixels receive closer amounts of sun light. This amount increases as the slopes are more directed to the south. Therefore, in the analysis chapter, the aspect parameter is an indication for the effect of the sunlight amount.

Table 4.3. Corresponding aspect values of 0 – 240 range for 0 – 360 range

0 - 240 Range	0 - 360 Range
0 – 30	0 – 45
30 – 60	45 – 90
60 – 90	90 – 135
90 – 120	135 – 180
120 – 150	180 – 225
150 – 180	225 – 270
180 - 210	270 – 315
210 - 240	315 – 360

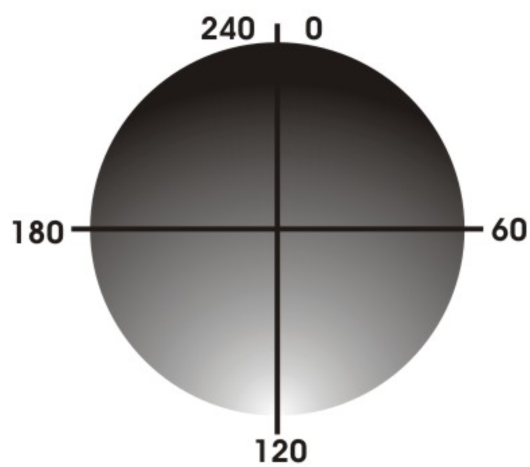

Figure 4.6. A scheme showing classification of aspect values by brightness, according to the direction

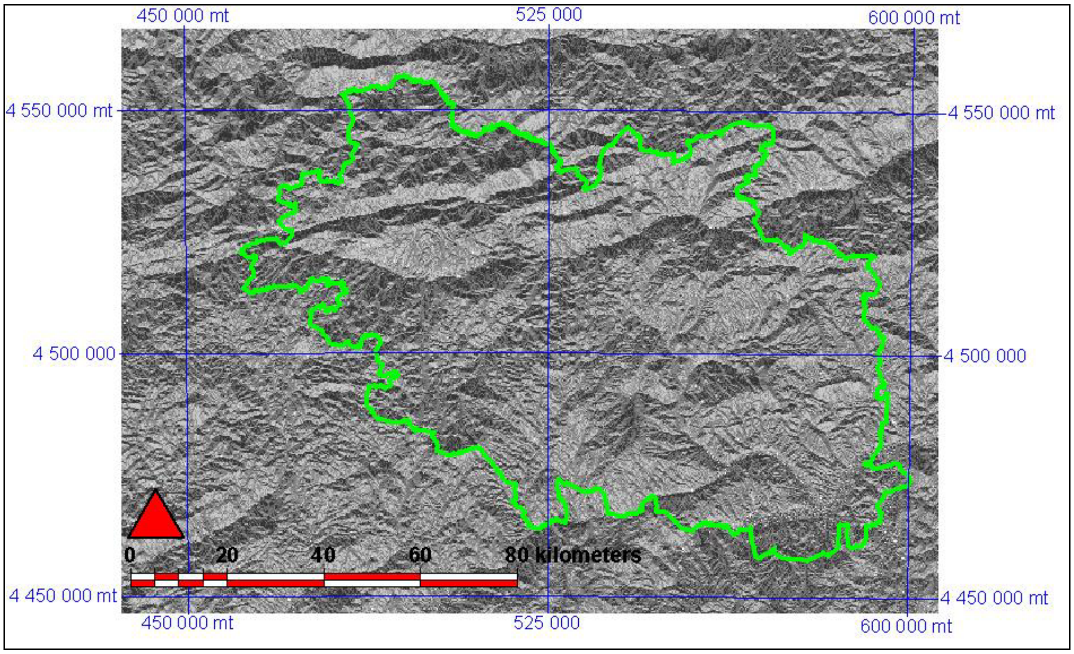

Figure 4.7. Classified Aspect Map

Soil Capability map taken from General Directiore of Rural Services, is a source indicating the agricultural efficiency. In Figure 3.8, there are eight classes, and the highest capable agricultural lands are shown with dark green color. The capability deteriorates as the color approaches to dark red.

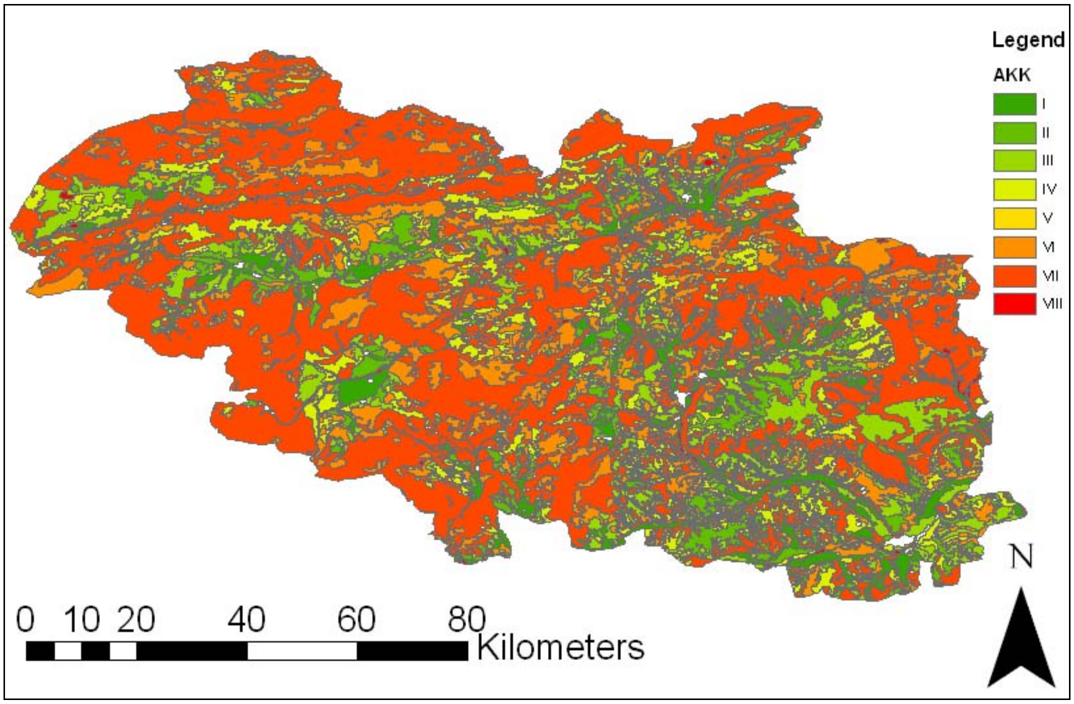

Figure 4.8. Soil Capacity Map

CHAPTER V

ANALYSIS

5.1. Construction of Socio-economic Index

This section explains the process of construction of an index representing the socio-economic status of each settlement. It is difficult as there are so many variables that may affect a settlement's socio-economic status, and it is debatable how much influence each variable has on the socio-economic structure.

A similar procedure like social area analysis was used in order to extract different dimensions of societies. However, the socio-economic dimensions were acquired not by a predetermined set of weights, but rather by Principle Components Analysis. Because, the data (195 variables) available doesn't fit to other standardized procedures like social area analysis or factorial ecology. Therefore objectivity could be assured by PCA. Similar methodologies were adopted by Grove (1996), Anaktakrishnan (1998) and Debroy and Indicus Analytics (2002).

The variables were first normalized by the number of households for each village. Normalization by area was not appropriate because this method produced high socioeconomic status for villages with very small area.

Similarly, population could be used for normalization. However, as the study was carried out in a rural space, the wealth of each family could be interpreted as the wealth of that family, rather than its individuals.

5.1.1. Classification of Indicators

There were 195 variables used for the analysis, which were highly uncorrelated with each other. First the whole data were divided into 3 subgroups representing different kind of information in each, like social area analysis. These subclasses were

a) Economic: This class directly relates to the production and consumption patterns of the people of the villagers. There are 88 variables in this group, relating vehicles, livestock, crops, agricultural tools (e.g. plow), house wares.
b) Service: Other than the villages' own resources, some values are added to the settlements from rather outside factors. The main outside factor here is the state, as it provides important services like electricity, water (irrigation) etc. which contributes to the quality of lifestyle quite much. There are 36 variables in this group, relating public facilities (educational, service and infrastructure).
c) Social: Identification of social characters is a bit more difficult than the above two. Although the social pattern is also related to the economic conditions, it much more reflects the way people live. There are 71 variables in this group, relating recreational facilities, historical heritage, land ownership, housing type (e.g. wood, concrete), literacy and education level.

5.1.2. Principle Components Analysis (PCA)

PCA was applied for each group. The aim of PCA is to extract fewest components with high variances. However, in the first stage, the first components accounted for low variances; 12.6% for economic, 17% for service and 9.1% for social dimension. (See Figure D.1-8 for all component variances) That is because the variables had little correlation with each other, and therefore there was little redundancy. In order to extract higher variances with the first component, a similar method has been applied as Dunteman (1969) explained. The six variables contributing the most to the first component were selected as representatives of each dimension. (Six variables were found satisfactory as the first components produced enough variance) PCA was reapplied afterwards. This operation produced the first components accounted for 66.8% for economic, 67.2% for social and 38.5% for service group. The variances of each component, and the component loadings for all variables are shown in Appendix D. After the acquisition of the first components for each class, they were added (equal weighted) to create composite index of socio-economic status.

This index ranged between -6.22 and 28.38, and then was stretched between 0 and 10 by an Excel formula. In this formula, each record was subtracted from the record of minimum value among all records. Then this resultant value is divided to the range which is acquired by subtracting the minimum value from the maximum. This procedure provides results ranging from 0 and 1. Lastly, all the records were multiplied by 10 to create the final index.

As an alternative to this index, also another index, which was a logarithmical transformation of the similar index ranging from 1 to 10, was created. All economic, social and service indices, as well as the composite indices including the logarithmically transformed one, can be seen in Appendix C.

5.2. Extraction of Environmental Variables

This problem emerges if the boundaries of areal units are drawn by administrative authorities, and therefore it is actually possible to redraw those boundaries in a different way. In this study, this problem emerges too. Because the village boundaries are also determined by administrative authorities, modifiable unit problem exists in this study too. In Figure 5.1, the boundary of the village named Kısaç is shown. It isn't obvious what criteria were used to determine how to draw the boundaries. However, unlike Kısaç's boundary, the boundary of Kayıçivi reflects the natural pattern which is shown in Figure 5.2. For Kayıçivi village, the boundary sometimes passes the hill tops, or some times the valleys which are again determined by hilltops. Similarly, throughout the whole region, there are villages boundaries of which are determined according to natural structures and forms like hilltops, rivers, ridges and valleys. Some boundaries of the villages are determined according to human made structures like roads and railways, however they can be regarded as structures created by administrative authorities.

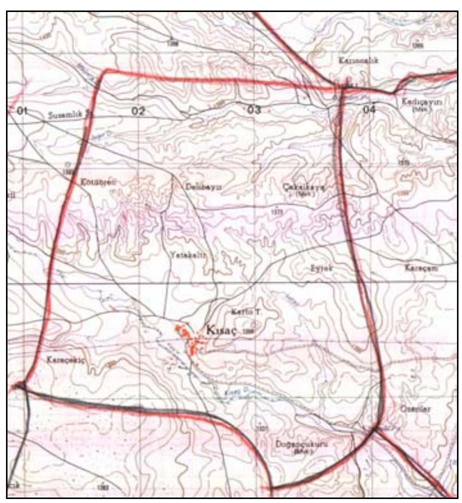

Figure 5.1. A village boundary as an example to arbitrary boundaries

Figure 5.2. A village boundary as an example to boundary creation by taking account of natural structure.

5.2.1. DEM parameters

Using TNT Mips 6.4, the raster statistics (mean, median, range, minimum, maximum) for each village were calculated from the digital elevation model. However, only Mean Slope, Mean Elevation and Mean Aspect parameters were selected as the explanatory variables among all of them.

5.2.2. Proportion of High Capable Soil

For each settlement, the ratio of high capable soil in total area was found. In order to do that: Two vector layers, village boundaries and soil capacity maps were overlayed by intersection option in TNT Mips 6.4. 7731 polygons were extracted.

A sample data set from overlay operation is shown in Table 5.1; ID as the primary key for each village, CapClass as the capability class, and AREA as the area of the intersected polygon) However, it was not possible to find the total area of each class for each village polygon. The problem was that there were more than one intersected polygon (as there are three polygons whose Soil Capability Class value is “4” and ID value “3” in the example

Table 5.1). The possibility of this can be seen in Figure 5.3, where such polygons are shown as hatched. These polygons' total area valued had to be found as in Table 5.2. Another problem was to distribute the area data to eight columns as in Table 5.3., indicating different capability classes (represented by I, II, III, IV, V, VI, VII and VIII) , which was not possible in any GIS or database program available.

Table 5.1. Overlayed Table with Raw Values

ID for each Village	Soil Capability Class	AREA (m^2)
3	2	566995
3	3	963609
3	3	79838
3	4	8428
3	4	10402
3	4	5365
3	6	446140
3	7	1576811
3	7	8892080
3		125141
4	1	803273
4	2	1126182
4	2	1236254
4	2	907889
4	3	418528
4	3	642457
4	3	216509
4	3	53411
4	3	6417
4	4	192482
4	4	884177
4	4	1473829
4	7	36548566
4		90657

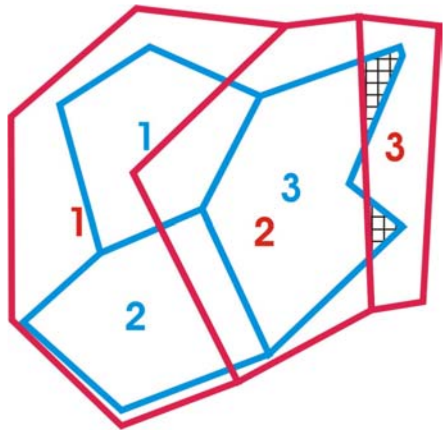

Figure 5.3. A scheme showing a possible overlay

Therefore, a short program was written for this study in MatLAB, that first aggregates the area values and then transforms this data into desired format. (see Appendix G)

These values were then normalized by the whole area of each settlement, becoming percentage values. To form an explanatory variable out of all eight parameters, the first four were summed. (As the first four are suitable for agricultural activities, Çankırı Arazi Varlığı, 1998)

Table 5.2. Overlayed Table with Aggregated Values

ID for each Village	Soil Capability Class	AREA (m^2)
3	2	566995
3	3	1043447
3	4	24195
3	6	446140
3	7	10468891
4	1	803273
4	2	3270325
4	3	1337323
4	4	2550487
4	7	36548566

Table 5.3. Overlayed Table with Transformed Values

Area Distribution of Each Soil Capability Class for Each Village ID								
ID	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
3	0	566995	1043447	24195	0	446140	10468891	0
4	803273	3270325	1337323	2550487	0	0	36548566	0
5	0	3543	0	0	0	0	24105876	1431121
6	397	0	0	0	0	0	14822982	0

5.2.3. Integration of Index and Environmental Forces into the Areal Units

The records in the tabular data were labeled in order to join to the GIS data in graphical units. Afterwards, the tabular data was joined using this unique field using TNT Mips 6.4.

5.3. Visualization of Data

Chropleth mapping of independent and dependent variables was implemented using Arcview GIS 8.2.

In the Figure 5.4, the darker colored polygons represent the villages with high mean slope. The figure therefore shows that the northern parts embody the highest topographical roughness throughout the area. It is also clear that villages in the Kızılırmak basin have relatively lower amount of slope.

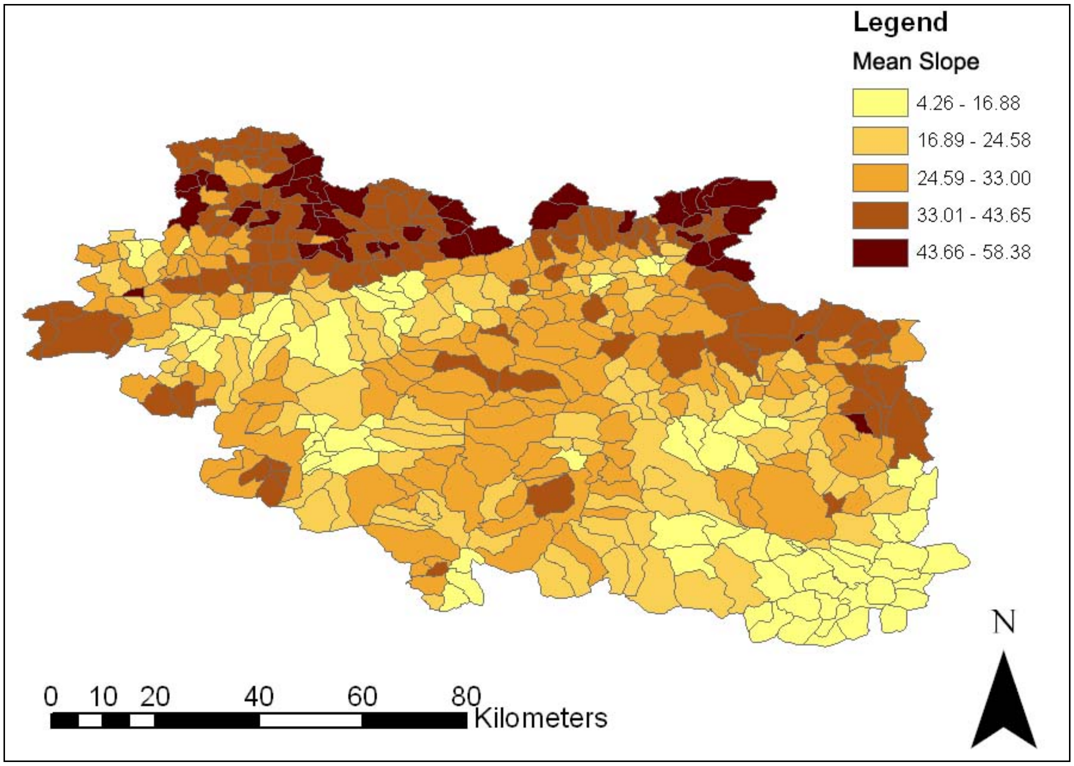

Figure 5.4. Mean Slope Map

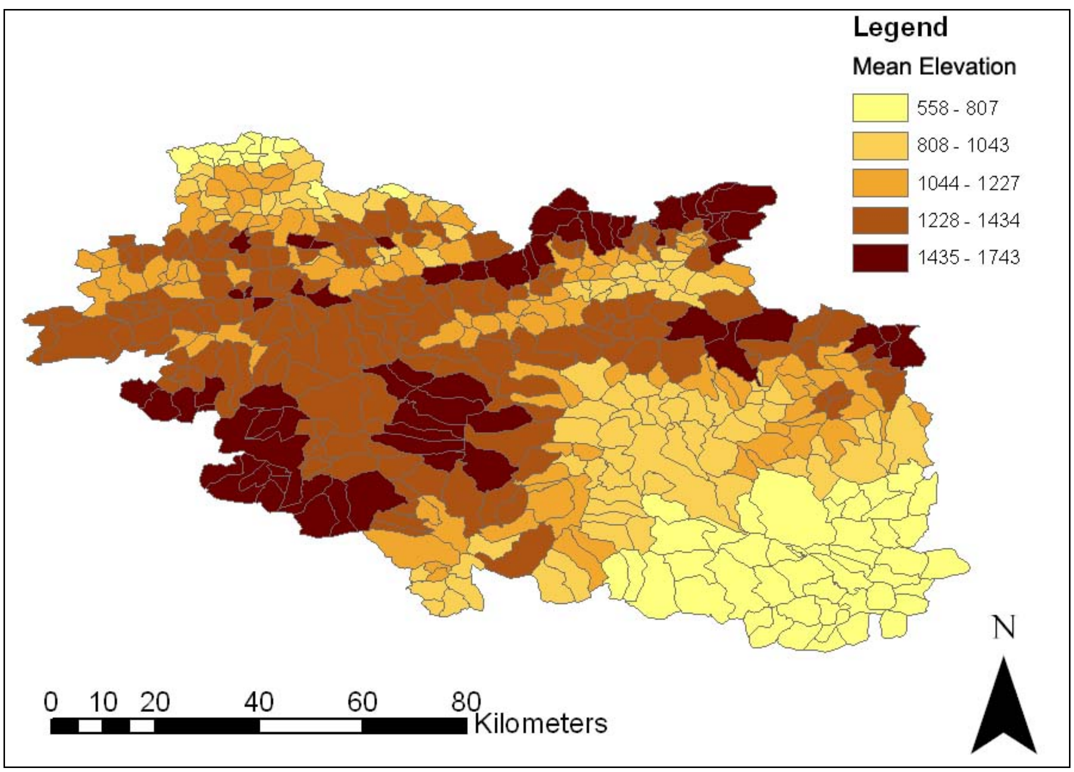

Figure 5.5. Mean Elevation Map

In the Figure 5.5, the villages with high mean elevation are represented by darker colored polygons. The figure thus can be interpreted that, there are villages with high mean elevations in the northeast-southwest direction.

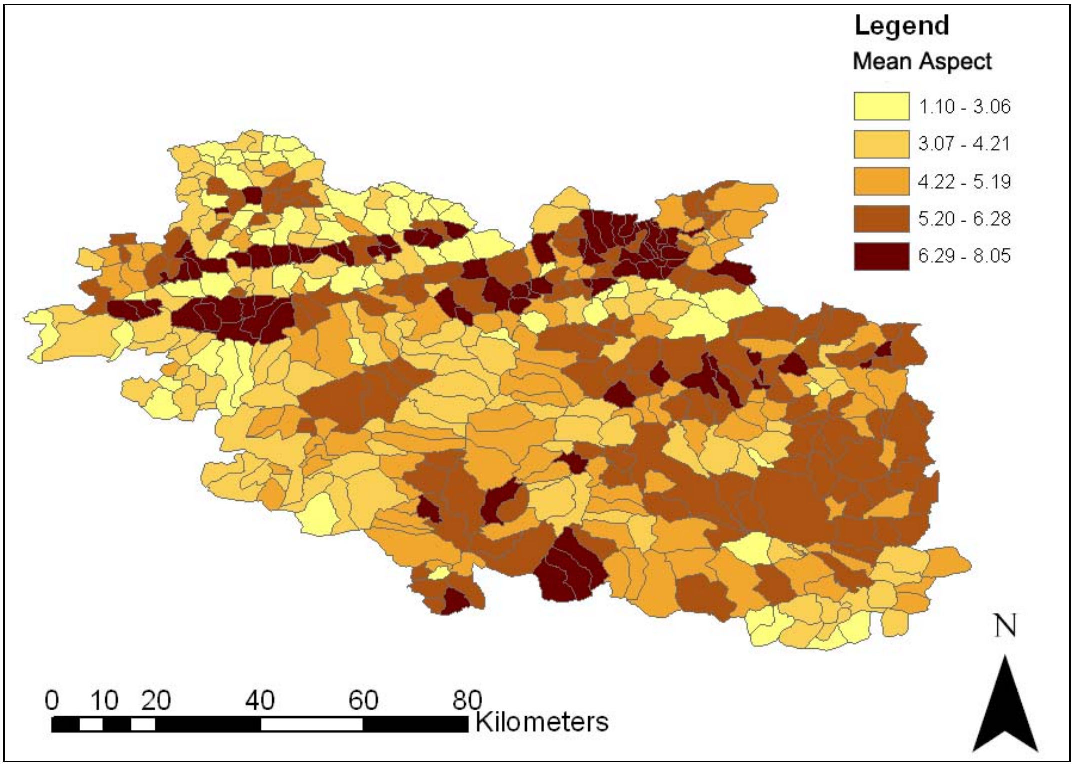

Figure 5.6. Mean Aspect Map

The aspect map, which is shown by Figure 5.6, serves as an indicator for differentiating between northern looking slopes, which are represented by lighter colors, and southern looking slopes, which are represented by darker colors.

In the Figure 5.7, the villages, which have abundance of highest capacity soil, are represented by darker colors. The figure shows that villages of the Kızılırmak Basin (the southeastern part), enjoy relatively more agricultural potential, compared to the other parts.

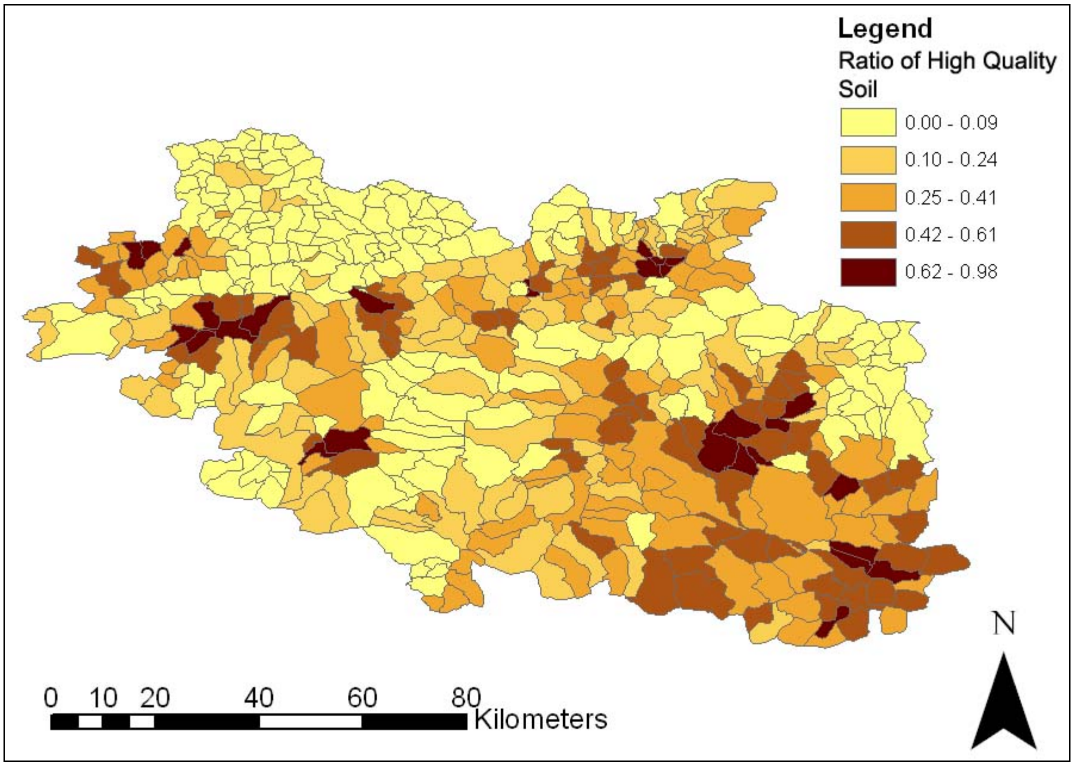

Figure 5.7. Highest Capacity Soil Map

Figure 5.8 shows that, the economy scores for all villages are very close to each other, except for a few outliers shown with dark color. The high economy scores are achieved at the north eastern section of the region. The service score map in Figure 5.9 is not as much homogeneous as the economy map. Besides, the maximum outliers are also observed at other places than northeast part in this figure. The social scores are distributed in the most heterogeneous manner. (See Figure 5.10) The maximum outliers are mainly observed on the northeast southwest axis, whereas the minimum outliers are seen on the northwest southeast axis.

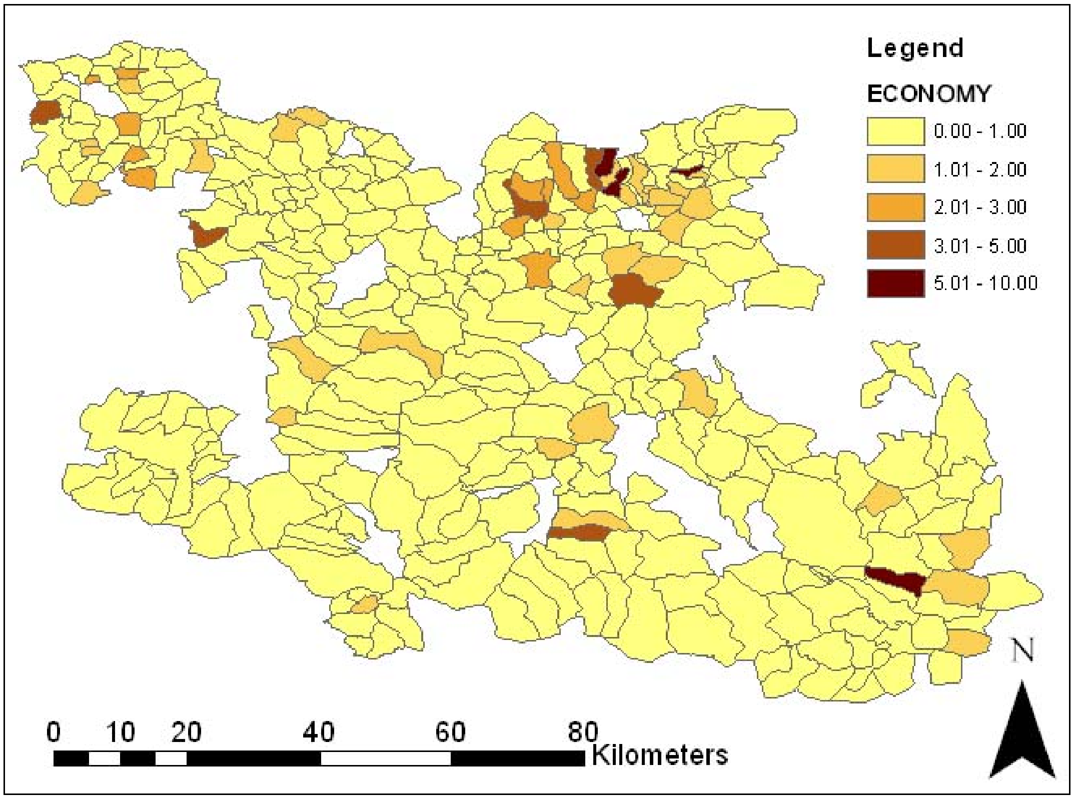

Figure 5.8. Distribution of Economy Scores

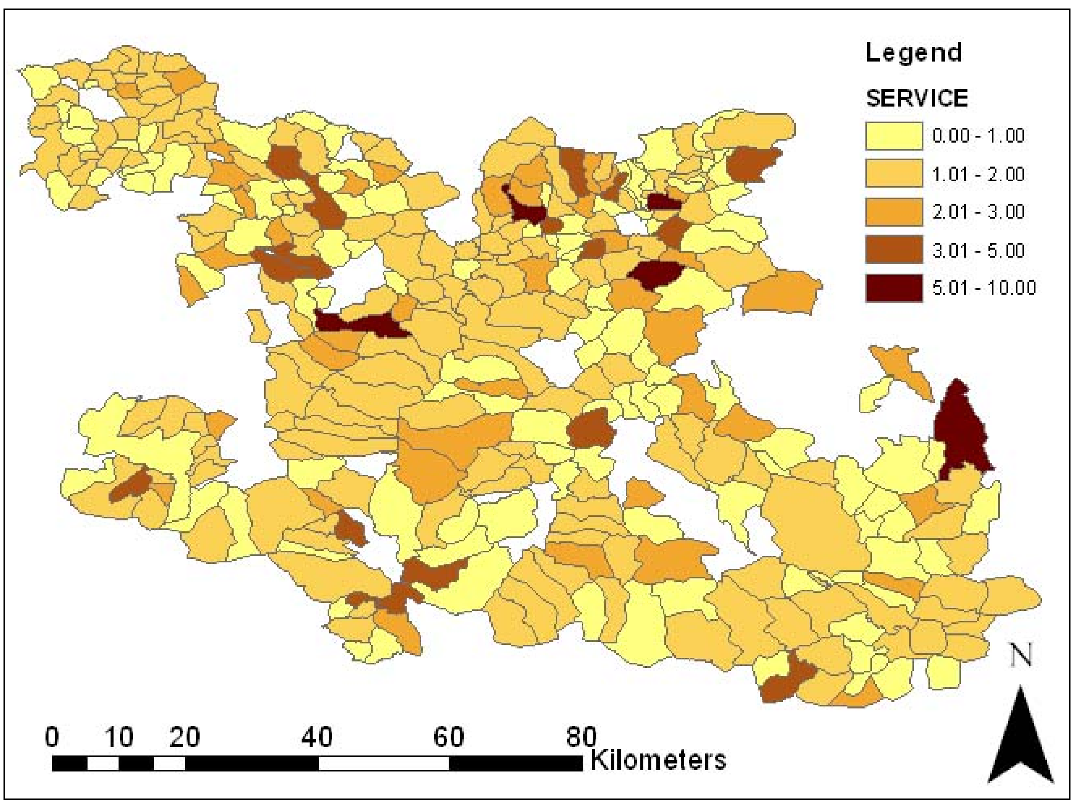

Figure 5.9. Distribution of Service Scores

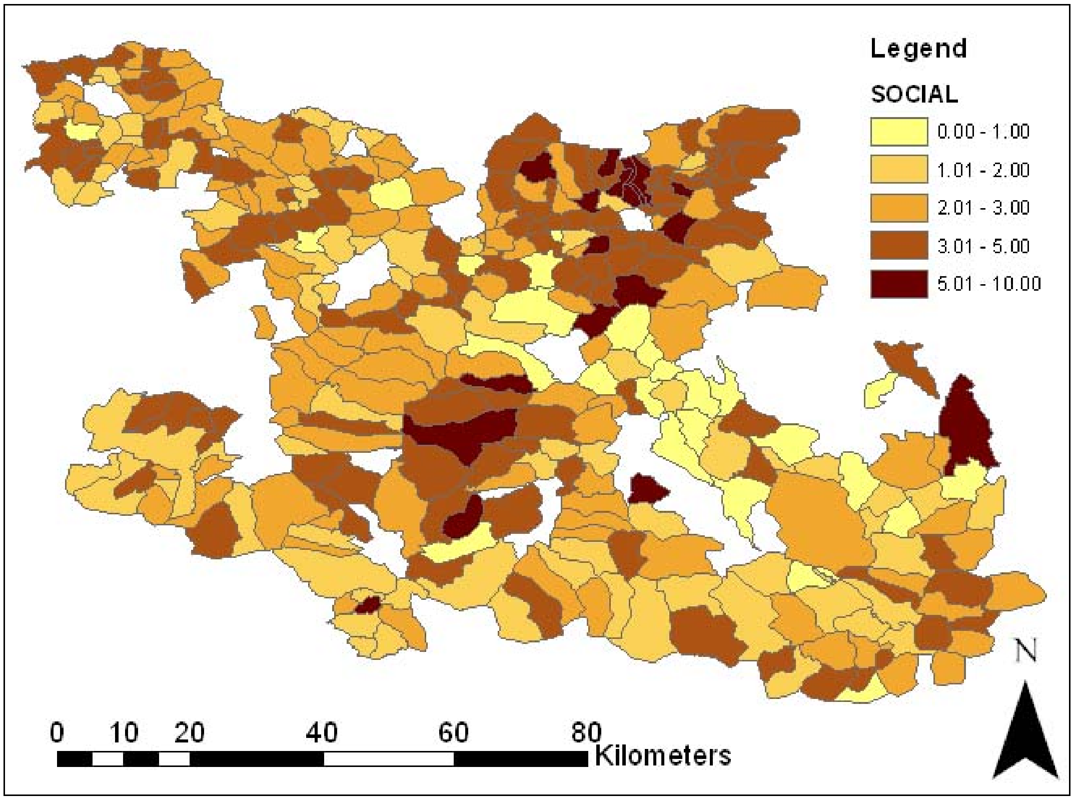

Figure 5.10. Distribution of Social Scores

Finally, the socio-economic status, which is a combination of economy, service and social scores (Figure 5.8, 5.9, 5.10), is visualized as in Figure 5.11 and Figure 5.12. Since the combination is made in an equally weighted form, no single group can dominate the socio-economic status by itself. The most obvious similarity between these groups and socio-economic score is the high scores attained in the northeastern section. Figure 5.11 represents a conventional method of display, where the data are shown in 2 dimensional view. Whereas for the Figure 5.12, cartograms were produced using Cartogram.avx extension and cartograms were extruded commensurate to the socio-economic status, forming a 3 dimensional view. Both figures indicate too much heterogeneity, even among adjacent villages. However, it is noteworthy to attract to the northeastern part, where the villages have relatively higher socioeconomic status scores.

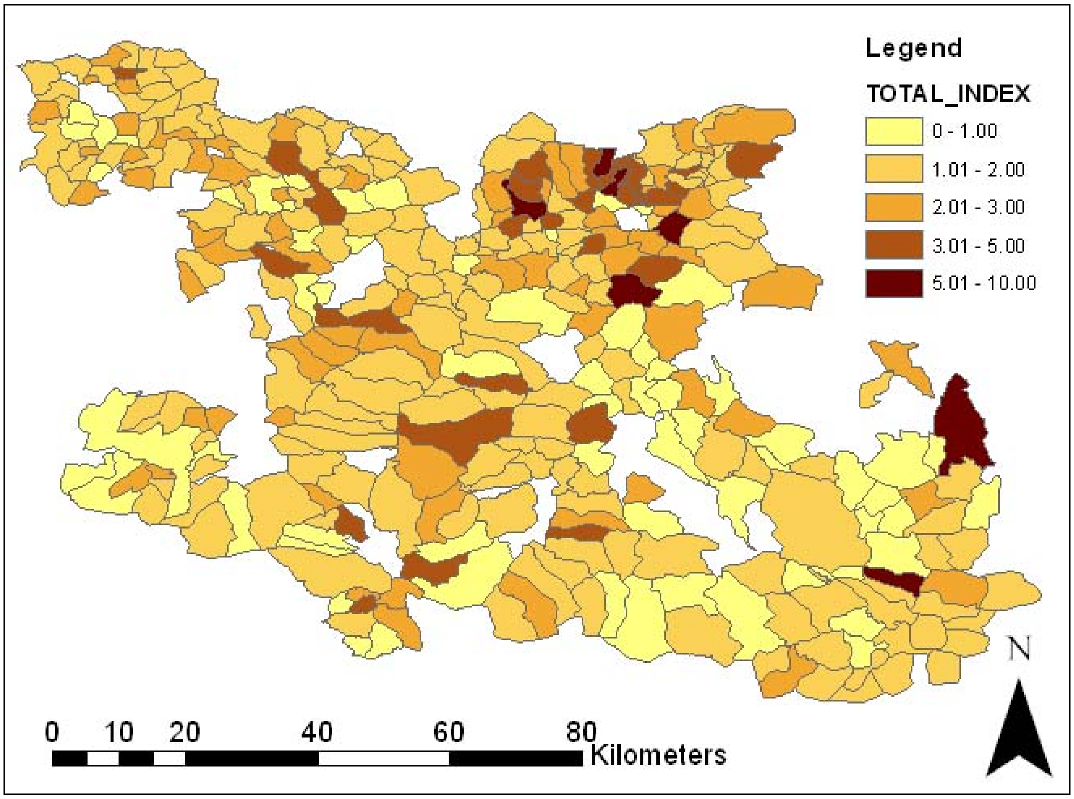

Figure 5.11. Socio-Economic Status Map

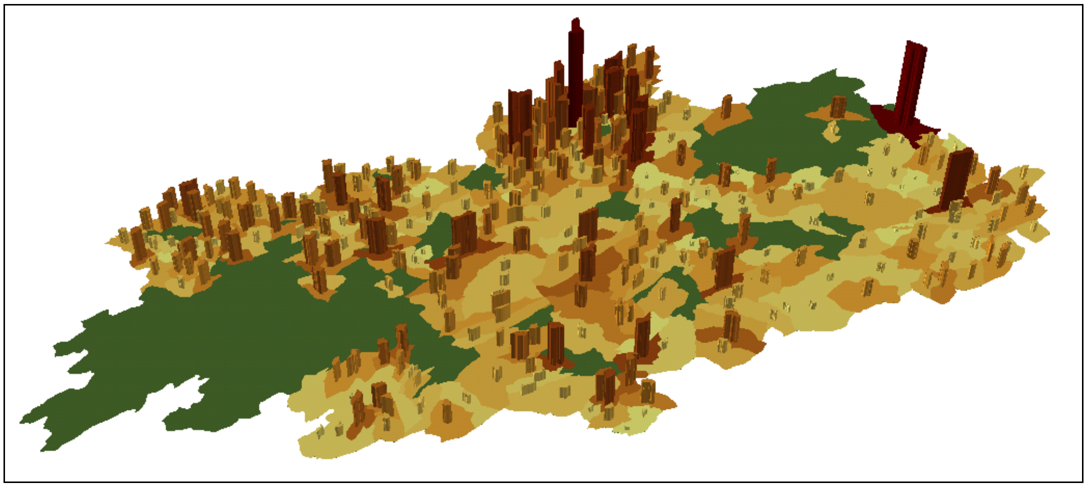

Figure 5.12. Socio-Economic Status Map: Cartogram mapping with 3D view (Green areas show the missing data)

5.4. Exploration of Data

It is the socio-economic status score that was explored in this study. Knowing that it is the nature of environmental parameters to have spatial relationships, it is desired to be discovered, whether spatially proximate villages have relationships with each other as well.

5.4.1. Correlograms

Moran's I, Geary's C statistics were used to create correlograms of the areal units of the study area for the socio-economic status. The data (shown in Table 5.4) included autocorrelation statistics for a range of spatial lags from 1000 meters to 30000 meters, also including first order (neighborhood level) autocorrelation.

The correlograms (Figure 5.13 and Figure 5.14), which were acquired from Table 5.4 can be interpreted as follows: Autocorrelation is highest, though moderate (slightly above 0.3) in the first 5000 meters , according to

Moran's I statistic. For the same statistic, it drops to 0.076 which means almost no second order effect for 30000 meters. (See Figure 5.13)

Table 5.4. Moran's I and Geary's C Values

Distance (meters)	Geary's C	Moran's I
First Order	0,888	0,1693
1000	0,9773	0,3184
3000	1,02	0,3184
5000	1,021	0,3184
6000	1,02	0,2925
7000	0,9995	0,255
8000	0,9884	0,2071
9000	1,059	0,2034
10000	1,022	0,1862
20000	1,041	0,1391
30000	0,9773	0,07632

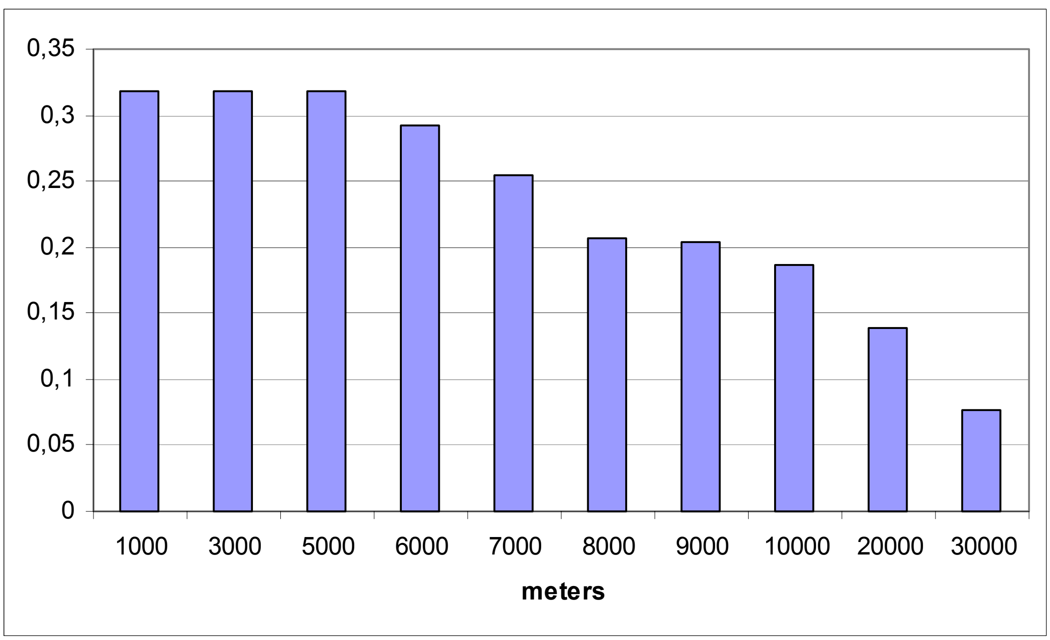

Figure 5.13. Correlogram: Moran's I

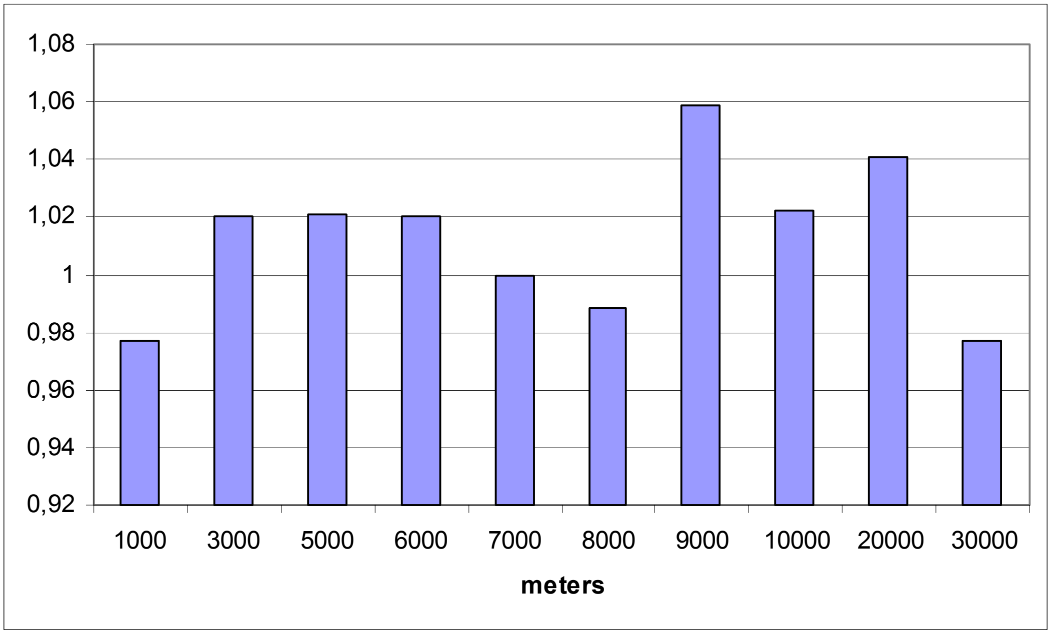

Figure 5.14. Correlogram: Geary's C

The correlogram (Figure 5.14) for Geary's C statistic is somehow more difficult to interpret, and less useful compared to that of Moran's I statistic. The C value fluctuates as moving to larger spatial lags from smaller ones. It is noteworthy to indicate that, the autocorrelation is almost non-existent, for the reason that all C values for all lags are very close to 1, which indicate no spatial correlation.

5.4.2. Spatial Moving Averages

This technique was applied in order to see the general trend of the socio-economic status over the area.

There wasn't any readily available GIS functionality, therefore Spatial Moving Average was implemented by a MatLAB routine written for this thesis (see Appendix G), that reads the number of closest spatial neighbors (calculated according to the centroid to centroid distances) from the user, and calculates the average value of these neighbors, which would be assigned as a new data. For this analysis, a distance matrix (see Appendix E) as input data had to be created by CrimeStat software.

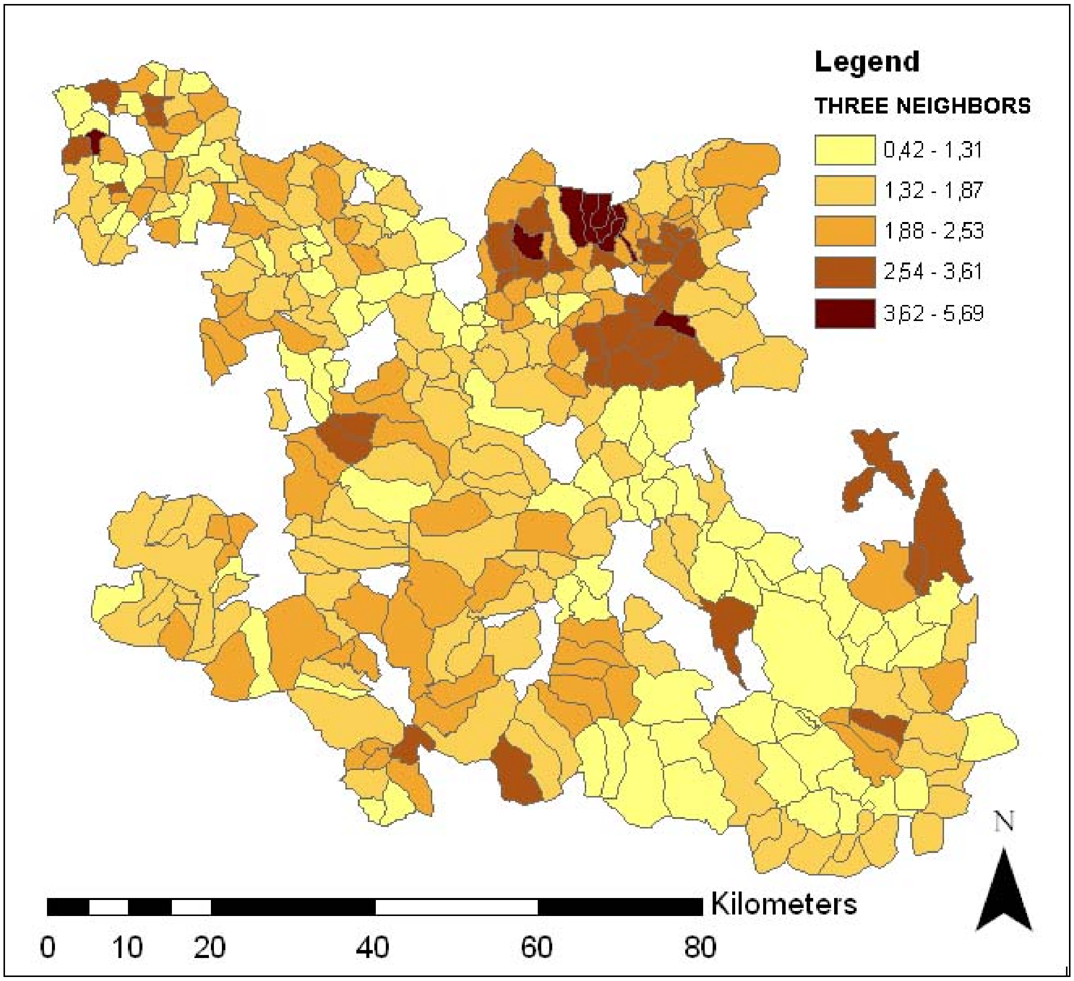

Figure 5.15. Spatial Moving Averages with 3 neighbors

When compared with Figure 5.11 indicating the prior visualization step, the spatial moving averages with 3 neighbors as shown in Figure 5.15, does not offer much information to derive. Figure 5.15 quite much resembles to Figure 5.11, because of too few neighbors used. There isn't much to say about the general trends in the area, since the socio-economic status values are still distributed very heterogeneously.

In Figures 5.16 and 5.17, implementation of Spatial Moving Averages with 10 and 20 neighbors is shown.

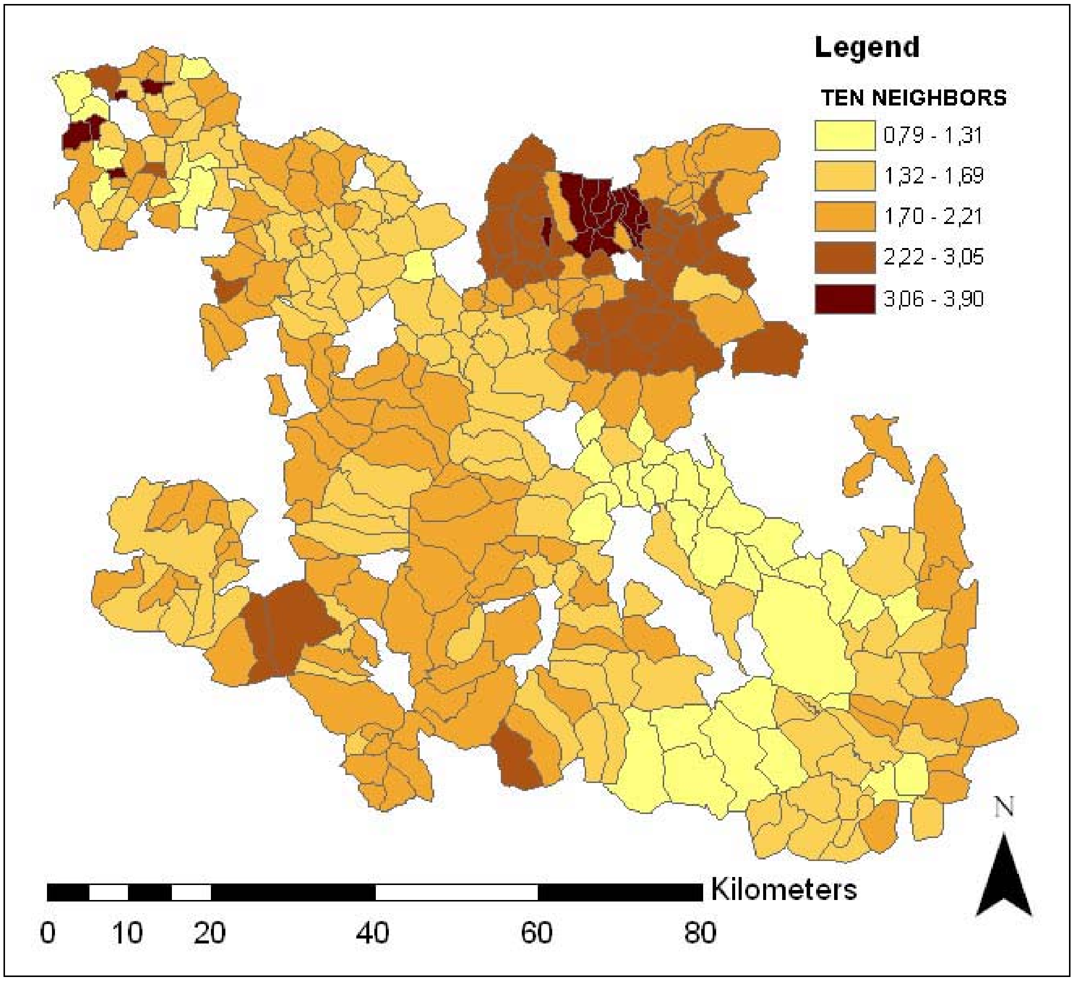

Figure 5.16. Spatial Moving Averages with 10 neighbors

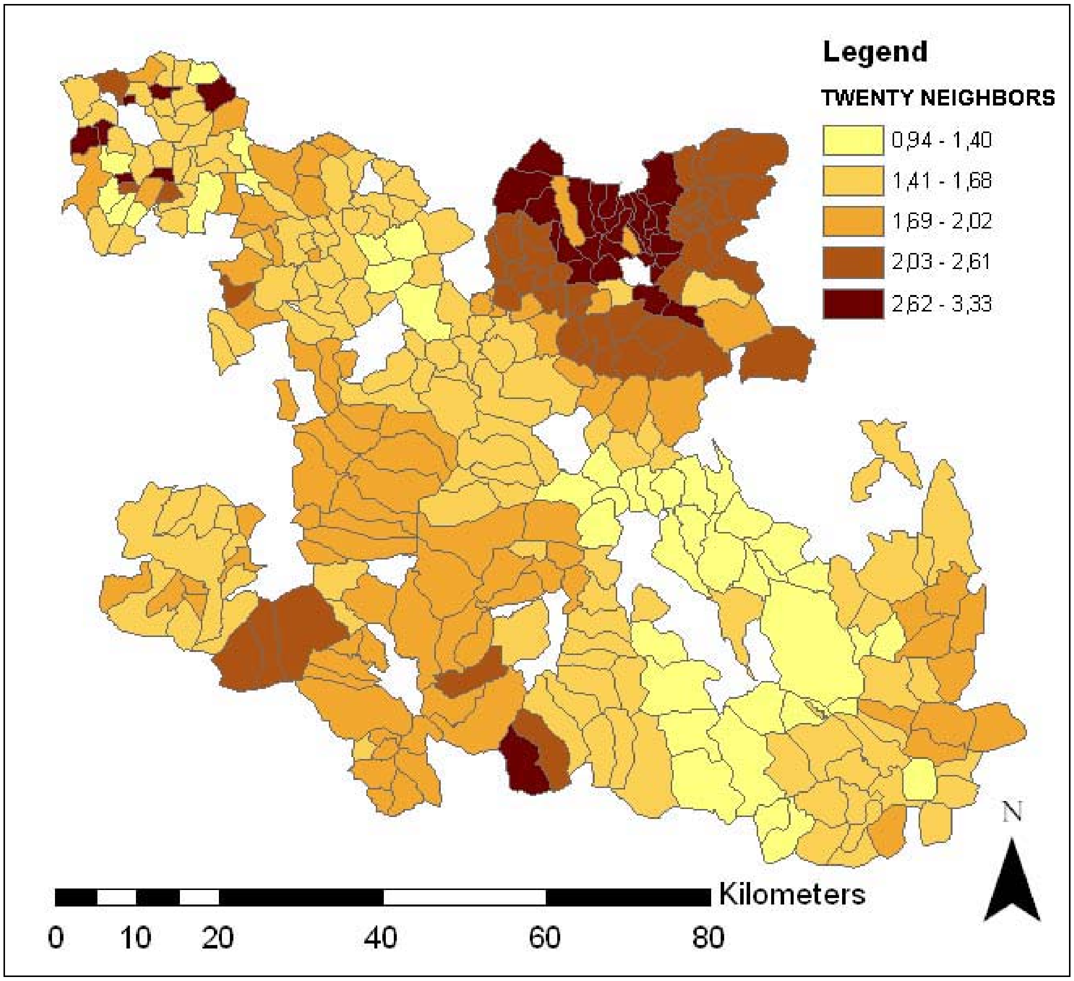

Figure 5.17. Spatial Moving Averages with 20 neighbors

5.4.3. Geographically Weighted Regression Analysis

Geographically Weighted Regression Analysis was applied with the software package GWR3. The kernel bandwidth was determined by AIC (AICc) minimization. As the adaptive kernel was used, the bandwidth was specified as the number of data points in the local sample used to estimate the parameters (GWR3 Manual, 2003).

In this analysis the equation can be formulated as follows:

$$Y = a_1 + a_2X_1 + a_3X_2 + a_4X_3 + a_5X_4 \quad 5.1$$

where Y denotes the dependent variable socio-economic index score, a_1, a_2, a_3, a_4 and a_5 represents the intercept, and coefficients of mean slope, mean elevation, mean aspect and ratio of high capable soil parameters. X_1, X_2, X_3, X_4 denote the independent variables mean slope, mean elevation, mean aspect and ratio of high capable soil.

The GWR was implemented for two indices. In addition to previously obtained index, a logarithmic transformation (which improved over this one in all regression analyses) of this index was added for analyses. With the first index the analysis produced R^2 ranging between 15.3% and 32.7%. For the logarithmic transformed index the R^2 improved by reaching to a range of 18.1% and 35.3%.

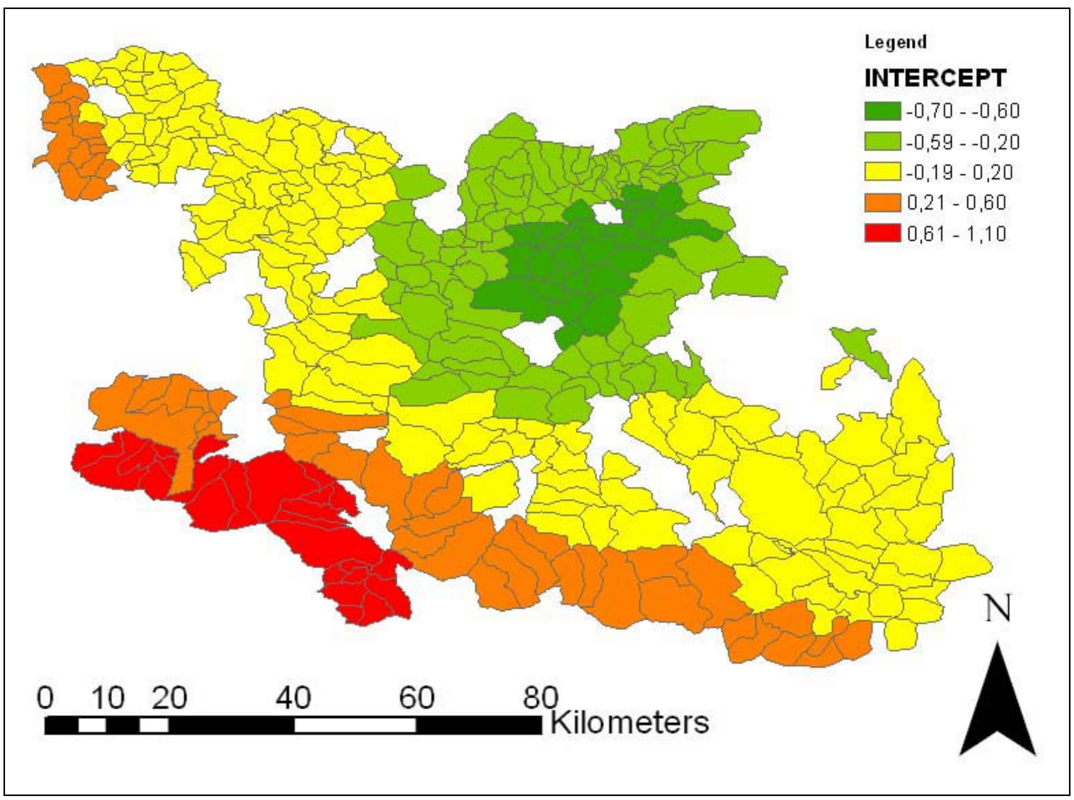

Figure 5.18. GWR: Intercept

Intercept map (Figure 5.18) can be interpreted as: The minus values (represented by green color) indicate existence of factors absent in the analysis, which account for a negative influence. Likewise, the positive values (represented by red color) indicate existence of factors absent in the analysis, which account for a positive influence. Accordingly, the intercept values close to zero (shown by yellow color) indicate a one to one relationship between the socio-economic structure and selected natural environmental parameters.

From Figure 5.19, it is apparent that slope has the highest influence in the northeastern section. Figure 5.20, shows that the effect of elevation is weakest in the central portion, while its positive effect is maximized in the northeast and minimized in the southeast.

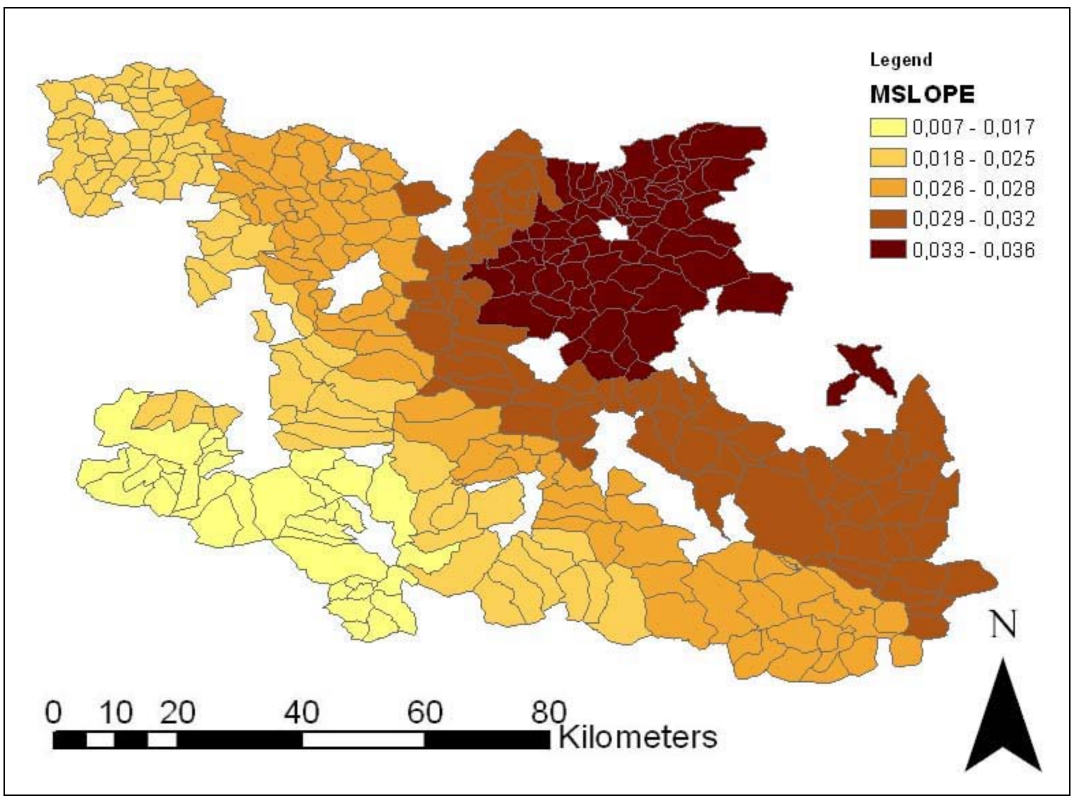

Figure 5.19. GWR: Coefficient of Mean Slope

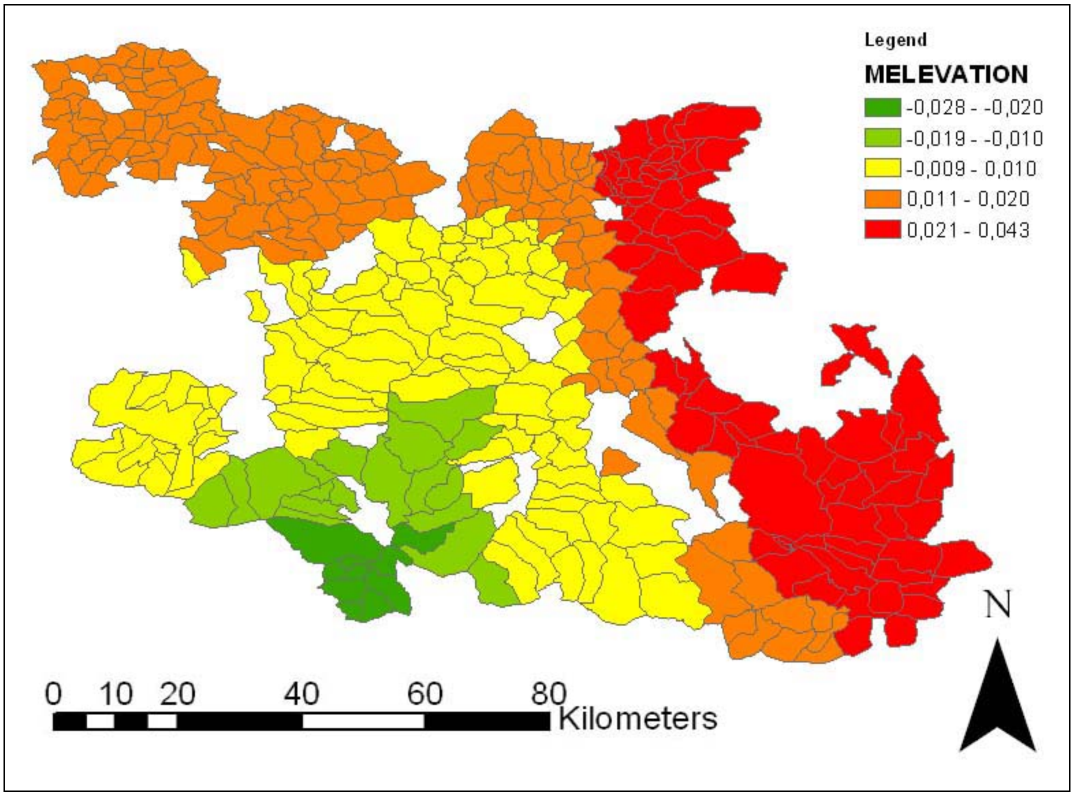

Figure 5.20. GWR: Coefficient of Mean Elevation

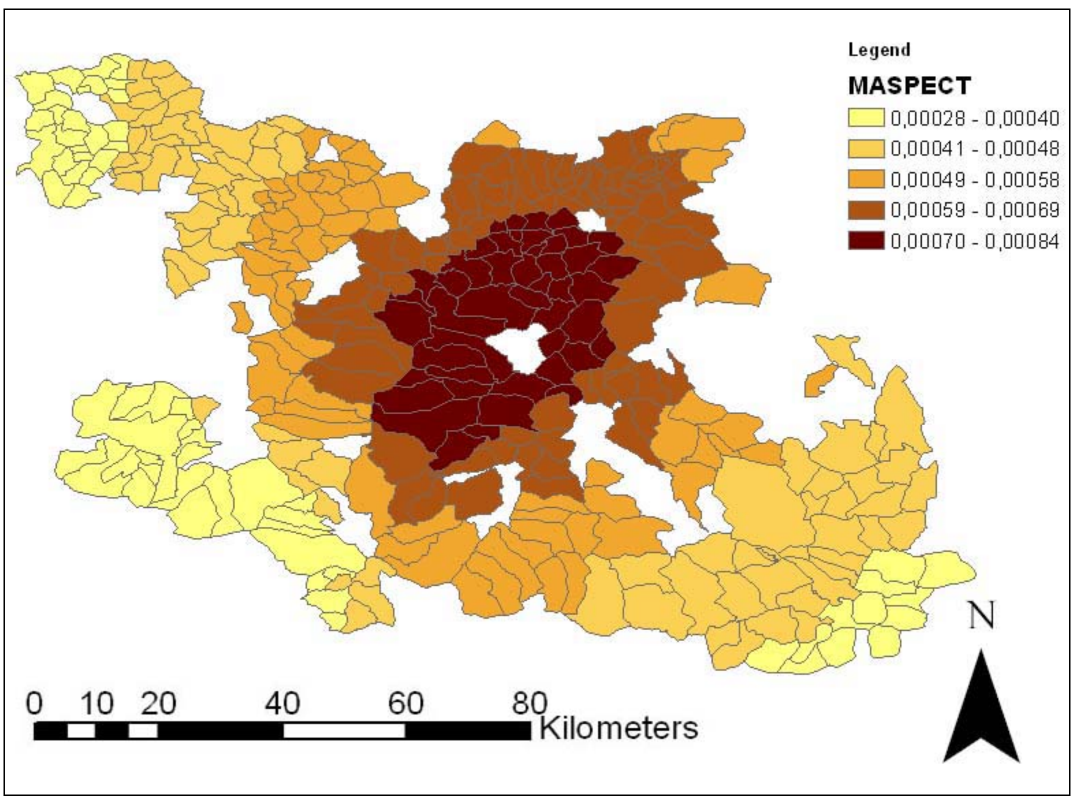

Figure 5.21. GWR: Coefficient of Mean Aspect

From Figure 5.21, it is apparent that aspect has the highest influence in the eastern part.

High capable soil parameter attained the highest influence in the northern part, as observed in Figure 5.22.

The R^2 maps are shown in Figure 5.23 for initial index, and in Figure 5.24 for logarithmically transformed index.

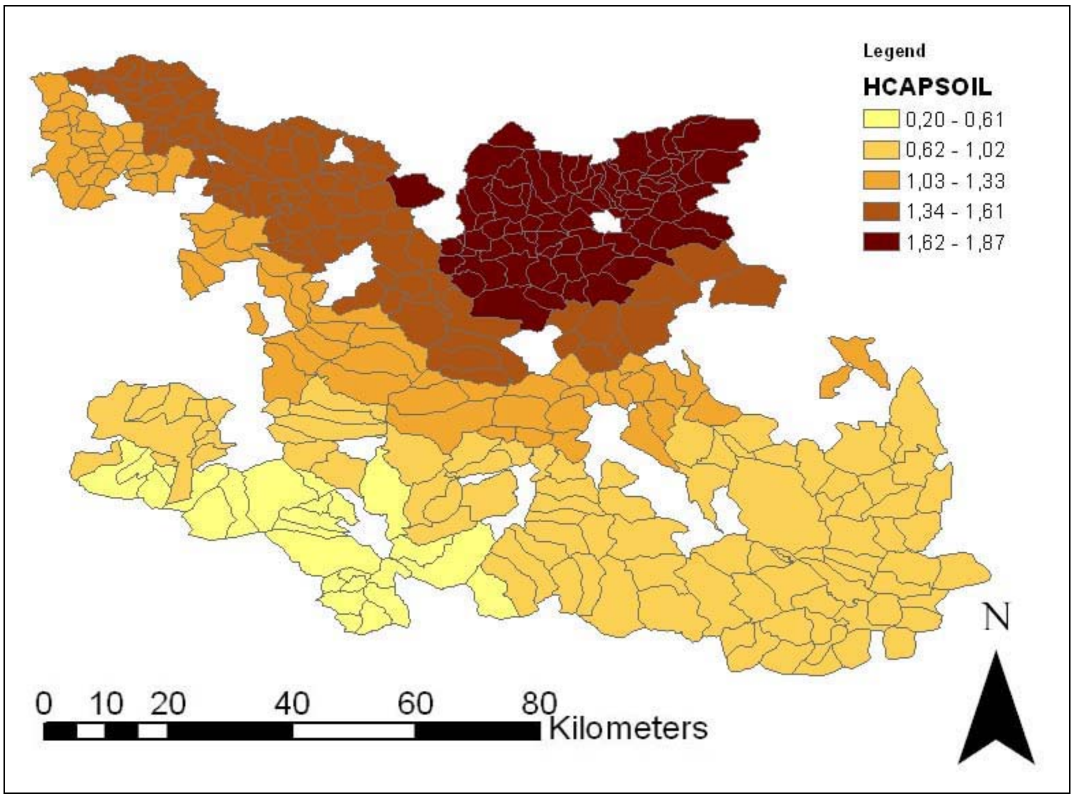

Figure 5.22. GWR: Coefficient of Ratio of High Capable Soil

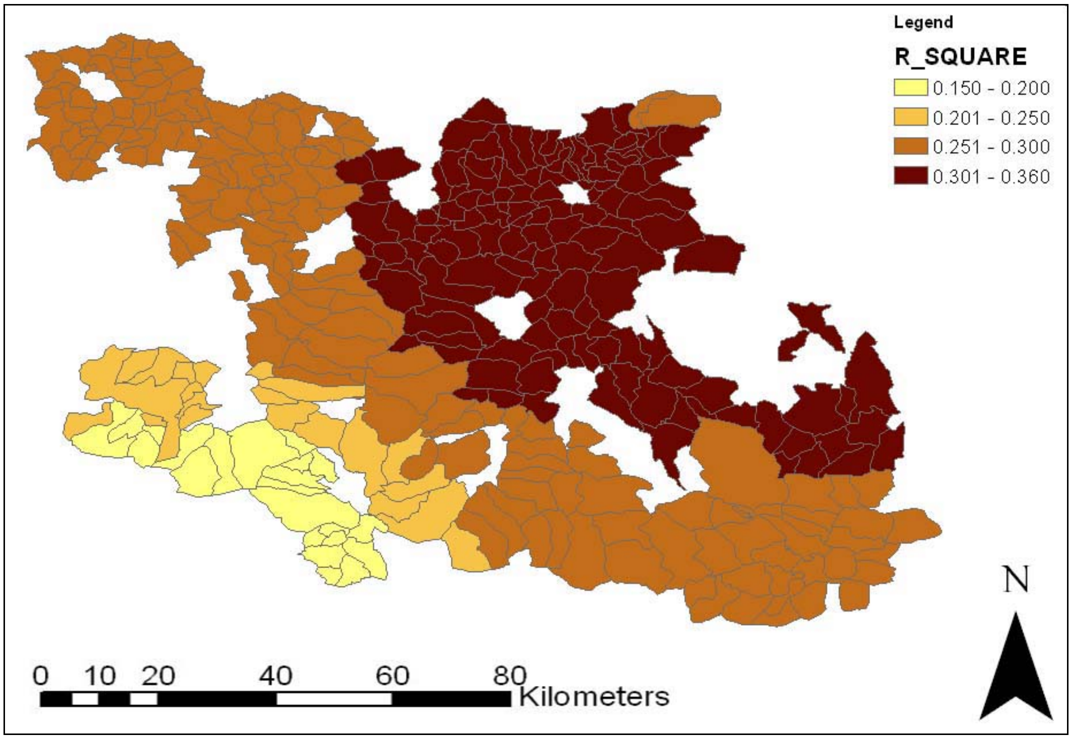

Figure 5.23. GWR: R^2 for the first index

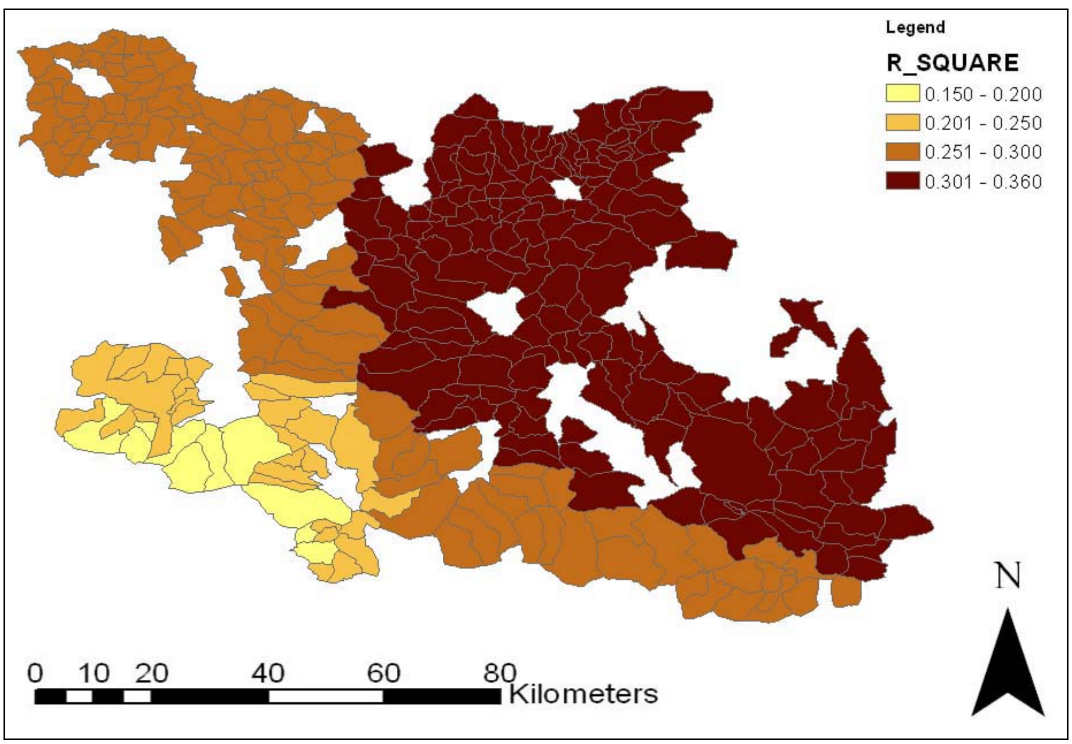

Figure 5.24. GWR: R^2 for the logarithmically transformed index

5.5. Modeling the Relation between Socio-Economic Structure and Some Topographical Parameters of Natural Environment

There were predictions for the areas with high score for socio-economic index, that they would more likely to have less mean slope and mean elevation values, high mean aspect values, and high proportion of high capable soil. Thus, H_0 and H_A was designed as follows:

H_0: No correlation exists between socio-economic structure and natural environmental parameters, which are mean slope, mean elevation, mean aspect and proportion of high capable soil calculated for each village.

H_A: A correlation exists between socio-economic structure and natural environmental parameters, which are mean slope, mean elevation, mean aspect and proportion of high capable soil calculated for each village.

This relation was tried to be found by first conventional (non-spatial) linear regression analysis and spatial regression analysis, for which:

$$Y = a_1 + a_2X_1 + a_3X_2 + a_4X_3 + a_5X_4 \qquad 5.2$$

where Y denotes the dependent variable socio-economic index score, a_1, a_2, a_3, a_4 and a_5 represents the intercept, and coefficients of mean slope, mean elevation, mean aspect and ratio of high capable soil parameters. X_1, X_2, X_3, X_4 denote the independent variables mean slope, mean elevation, mean aspect and ratio of high capable soil.

5.5.1. (Non-Spatial) Multivariate Linear Regression Analysis

This analysis models the relation between the socio-economic structure and the environmental parameters without integrating spatial dimensionality. It is thus important for seeing what differences are made by using spatial analyses.

Non-spatial regression model takes the form of

$Y = a_1 + a_2X_1 + a_3X_2 + \dots$ 5.3

where Y is the dependent (socio-economic structure) and X's are the independent variables, which are the environmental factors in this case.

Table 5.5. Linear Regression Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.240	0.057	0.046	1.12384

Table 5.5 indicates the Linear Regression Model Summary. The R^2 value, coefficient of determination, is very low (0.057).

Table 5.6. Linear Regression ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.110	4	6.277	4.970	0.001
	Residual	411.743	326	1.263		
	Total	436.853	330			

The whole regression mode is found significant: The F ratio is 4.970, above the value in the F distribution table at 0.01 significance level (3.72). thus the null hypothesis can be rejected in favor of the alternative H_A, which asserts that "A correlation exists between socio-economic structure and natural environmental parameters, which are mean slope, mean elevation, mean aspect and proportion of high capable soil calculated for each village."

Table 5.7. Linear Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Constant	0.007	0.422		0.018	0.986
	Mean Slope	0.025	0.008	0.260	3.356	0.001
	Mean Elevation	0.031	0.045	0.039	0.695	0.488
	Mean Aspect	0.0004	0.000	0.122	2.053	0.041
	High Capable Soil	1.076	0.394	0.217	2.730	0.007

The reliability of the coefficients of the constant and the independent variables; whether the linear regression model can be relied upon as accounting for the causal relationship between the dependent and independent variables. The t value (0.018) is extremely low for the constant, and thus the H_O must be accepted. Similarly, among the independent variables, mean elevation parameter has also a low t value (0.696). The other coefficients of the three independent variables; mean slope, mean aspect and high capable soil were found reliable at the 0.05 confidence level.

Table 5.8 indicates the Linear Regression Model Summary for logarithmically transformed index (LTI). The R^2 value, improved (0.064) a bit over the R^2 of the previous model (0.057).

Table 5.8. Linear Regression Model Summary (LTI)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.252	0.064	0.052	1.41509

Table 5.9. Linear Regression ANOVA (LTI)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	44.441	4	11.110	5.548	0.000
	Residual	652.805	326	2.002		
	Total	697.246	330			

The F value shown is the Table 5.9 is large enough to reject the null hypothesis for the whole regression line at the significance level 0.0005

Table 5.10. Linear Regression Coefficients (LTI)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Constant	1.652	0.532		3.106	0.002
	Mean Slope	0.032	0.010	0.263	3.408	0.001
	Mean Elevation	-0.0004	0.057	0.000	-0.008	0.993
	Mean Aspect	0.0007	0.000	0.155	2.618	0.009
	High Capable Soil	1.352	0.496	0.216	2.725	0.007

The t values in Table 5.10 indicate that all parameters are significant except mean elevation (t = -0.008) at the significance level of 0.01.

5.5.2. Spatial Regression Analysis

For all spatial regression analyses, a distance weight matrix of 5000 meters was used. In Table 5.11, a SAR model for 5000 meters weight matrix, with coefficients, standard error and t values are shown.

Table 5.11. Spatial Regression Parameters with SAR Model and 5000 meters weight matrix

	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	0,4841	0,4831	1,0019	0,3171
Mean Slope	0,021	0,0085	2,4673	0,0141
Mean Aspect	0,0028	0,0472	0,0595	0,9526
Mean Elevation	0,0004	0,0003	1,3594	0,175
High Capable Soil	0,663	0,428	1,5489	0,1224

Table 5.12. Spatial Regression implemented with SAR and MA Models with 5000 meters weight matrix, for initial and logarithmically transformed index

	SAR	MA	SAR (log)	MA (log)
(Intercept)	0,4841	0,258	2.1402*	1.9015*
Mean Slope	0.021*	0.0237*	0.0266*	0.03*
Mean Aspect	0,0028	0,0151	-0,0179	-0,0077
Mean Elevation	0,0004	0,0004	0,0006	0.0007*
High Capable Soil	0,663	0.8607*	0,8451	1.0758*

* : Sigificant at 0.05

None of the attempts produced a model with all parameters significant as shown in Table 5.12. The closest was the MA Model, applied to the logarithmically transformed dependent variable. It was only the mean aspect parameter that was not significant at 0.05 level. Therefore, the aspect parameter was dropped from the model and recreated.

Residuals of each model can be mapped too. In the residual maps shown by Figure 5.25 and Figure 5.26, green color shows the areas which are over estimated, lighter colors show more correct predictions, and red color shows the under estimated areas. For the villages with yellow color, in other words the ones having low residuals, the environmental parameters have the best predictive power.

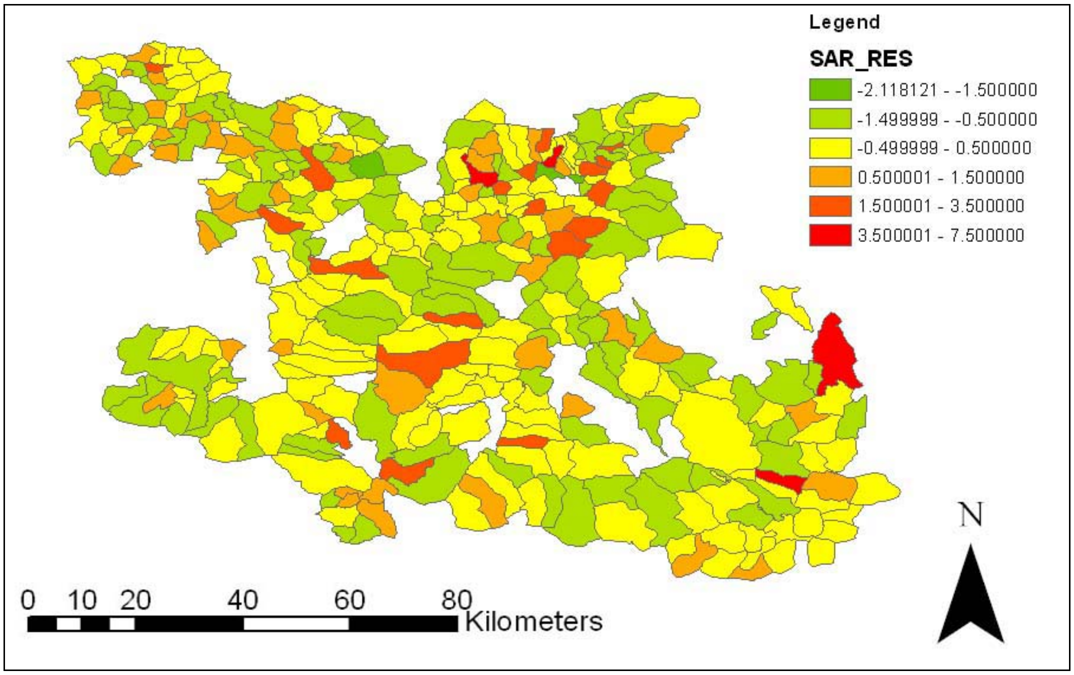

Figure 5.25. SAR Model Residuals

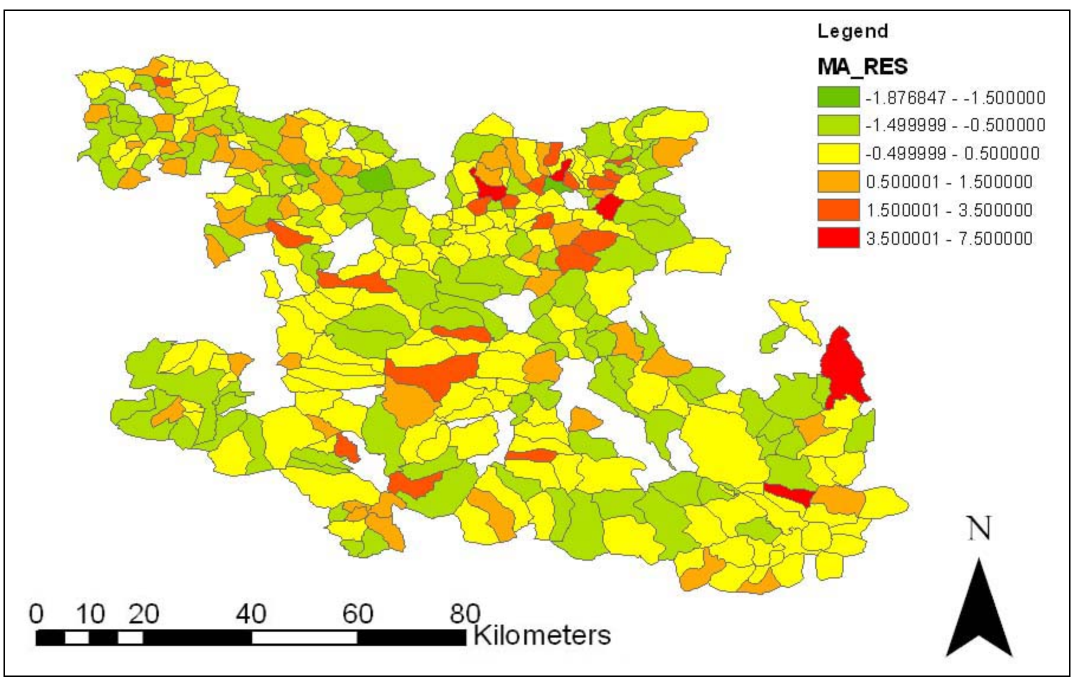

Figure 5.26. MA Model Residuals

Table 5.13. Spatial Regression Parameters for Logarithmically transformed index with MA Model and 5000 meters weight matrix, where aspect parameter is dropped out of analysis

	Value	Std. Error	t value	Pr(>|t|)
(Intercept)	1,8787	0,5622	3,3416	0,0009
Mean Slope	0,03	0,0104	2,8682	0,0044
Mean Elevation	0,0007	0,0003	2,1534	0,032
High Capable Soil	1,0642	0,5215	2,0405	0,0421

In the last Model (shown by Table 5.13), all the parameters are significant at 0.05 level.

5.6. Estimation of the Socio-Economic Index of the villages with no data

After the coefficients for each environmental variable is found, this model can be applied for the whole area to estimate socio-economic status of missing villages, too. (see Figure 5.27 and Figure 5.28) For this purpose, the MA model in which aspect was dropped and which was applied to the logarithmically transformed index.

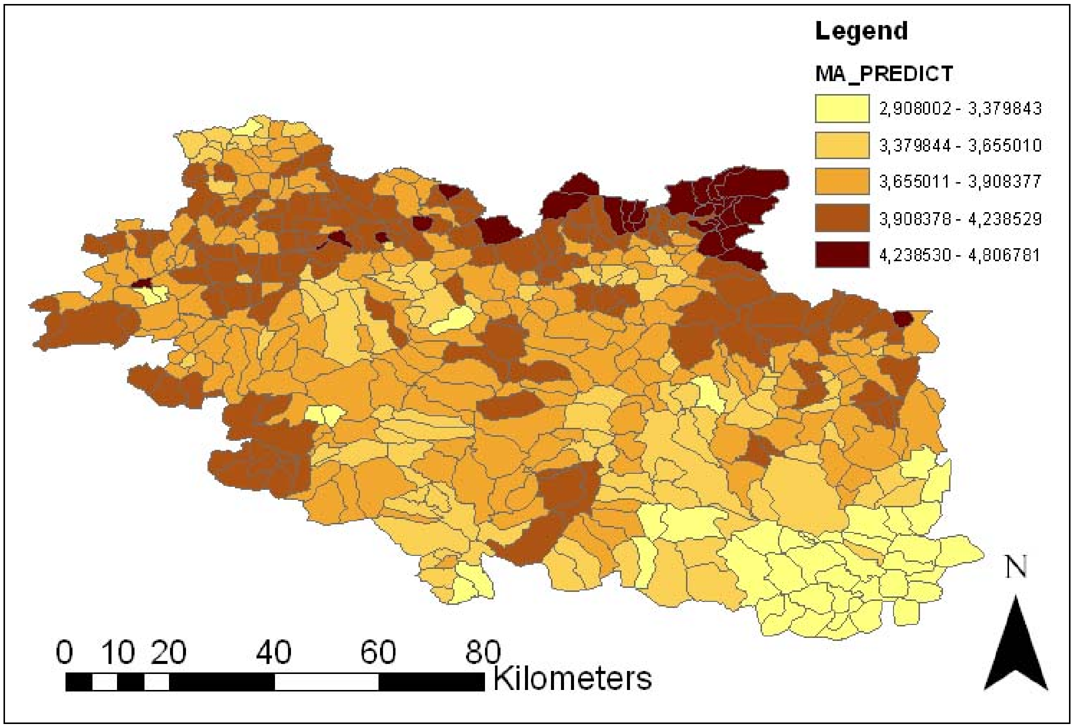

Figure 5.27. Predicted Values Map (Including missing settlements)

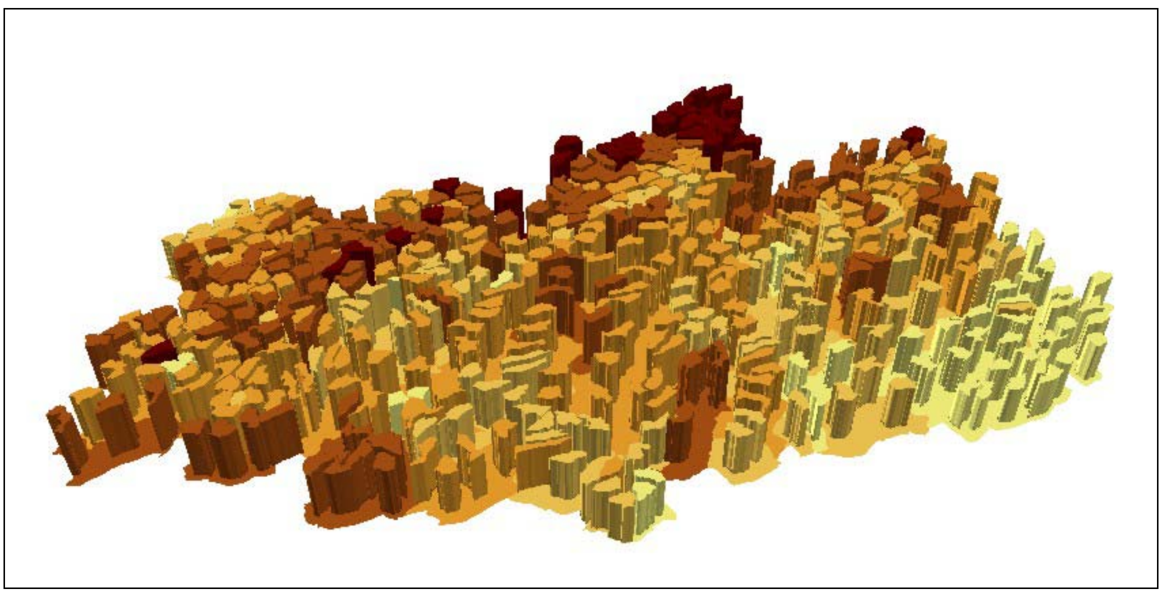

Figure 5.28. Predicted Values Map with 3D cartogram technique

5.7. Discussions

Before making any discussions, it should be remembered that, it is the village represented by a boundary, which is the main data unit. The size and the way boundary was shaped have also great importance as well as the location of the village. These important size and shape factors however, relate to the modifiable unit problem. Such factors are determined by administrative authorities, and can be regarded as arbitrary, although on some occasions natural entities like hilltops, valleys, rivers and ridges are taken as references. This is to say, the officials drawing these boundaries could have drawn these otherwise, which would greatly change the results obtained in the analyses section.

The first analysis included autocorrelation measures. For both Moran's I and Geary's C measures applied for socio-economic score, it is clear that spatially proximate units do not resemble each other. This situation gives a clue for the results of the further modeling stages, where the relationship between socio-economic status and environmental parameters is investigated. High spatial correlation for environmental parameters and low spatial correlation for socio-economic score can therefore be evaluated for an expectation of a weak relationship between the two phenomenons.

Remembering that it is the global Moran's I and Geary's C statistics used, these values are produced for the whole area. Therefore, it is not known, whether autocorrelation is higher for some other parts of the region. This idea can be supported by the Spatial Moving Averages methods outputs, as shown in Figure 5.9, 5.10 and 5.11. These maps show that some areas reflect more spatial trends in other words are more homogeneous when smoothened out, which is possible if the values of spatially proximate units are also close to each other. Therefore, global analyses are insufficient for detecting information in the local scale, which can be investigated via methods like geographically weighted regression, or localized versions of Moran's I and Geary's C measures.

By using spatial moving averages method, the interpretability increases, as the number of neighbors were increased in the analysis, shown in Figure 5.11 and Figure 5.12. Accordingly, this analysis shows that, northeastern section of the area has the highest socio-economic level throughout the whole region. Southwestern part also seems to have moderately high socio-economic level. Additionally, in the northwestern section, the socio-economic variability is very high, which looks the same even after applying spatial moving average with 20 neighbors.

The R^2 maps of GWR analysis (Figure 5.18 and Figure 5.19) show how good the regression parameters fit over the region locally, in other words, how much amount of determination for the dependent variable (socio-economic status), the independent variables account for at local scale. Both maps reflect a high explanatory power of independent variables in the Northeastern section. This can be interpreted as; the environmental parameters affect the northeastern part most. For the other parts, especially for the southwestern part, it is clear that such parameters have less explanatory power. Hence, it is logical to consider that, one should look for other things than the environmental parameters used in this analysis, to explain the socio-economic situation. Other detailed outputs gathered (including global statistics as well as t values and residuals for each settlement) can be found in Appendix F.

In brief, treatment to socio-economic and environmental parameters at local scale increases the strength of the R^2 (see Modeling Section 5.5), from 6% to a range of 18 and 36%. Beside of the scale advantage, the increase in R^2 can be explained as the intercept and elevation coefficients have both signs over the region, which in turn makes the model more flexible and therefore better predictive for the existing units.

GWR is a very powerful method for discovering local patterns and relationships, which can not be found by the global techniques. When inspected, GWR seems to be a robust technique for being a local analysis technique. The strength and even sometimes the sign (positive or negative) of the effect is prone to change throughout the whole region. It may be very helpful to compare the findings of GWR with the global techniques. The intercept value in GWR analysis ranges between -0.7 and 1.1. This value is almost 0 (0.007) for non-spatial linear regression, and 0.48 (SAR model) and 0.25 (MA model) for two models of spatial linear regression. For all parameters of the non-spatial linear regression, the coefficient values are close to the middle of the coefficient ranges found in GWR. SAR and MA models generally are not close to middle of those ranges. Additionally, for the aspect parameter, the coefficients of SAR and MA models exceed the range found by GWR. This difference can be explained the methodological difference of the spatial regression, for which the spatially proximate units have explanatory power for the dependent variable. The flexibility and locality of GWR can be seen here, as in the global analyses; the intercept and coefficient values are global and therefore generalized versions of GWR parameters.

As discussed in Chapter VI, the relationship was not powerful as expected in the beginning, with the data included rural survey data made in 1980 for socioeconomic structure, topographic data and soil capability data as the environmental factors, and areal data of village boundaries on which to analyze all other data together. Although strength of the relationship is not high, still, socio-economical structure can be better understood when concentrated to the settlements for which the residuals, obtained in the regression analyses, are lower.

In Chapter II, other variables like climate and natural resources (water, precious minerals) were especially emphasized, for their crucial role in affecting the human progress. These data, however, were not available, and if available not accurate to be evaluated for each village. The precipitation and temperature for example are only available for a few point locations, which are not sufficient to provide statistics throughout the whole region.

Again in Chapter II, the discussions were generally made on the global scale, including the development and progress of civilizations. In this study, the investigation was made for the village settlements which are distributed in a very small region. This may be interpreted as a factor for limiting the environmental variability which is expected to affect the socio-economical level. Moreover, the discussions of the Chapter II refer to other natural variables like climate which regulate the working performance and the agricultural output and natural resources (water, precious minerals) which is directly related to output, were especially emphasized, for their crucial role in affecting the human progress. These data, however, were not available, and if available not accurate to be evaluated for each village. The precipitation and temperature for example are only available for a few point locations, which are not sufficient to provide statistics throughout the whole region.

Several outcomes can be summarized, from the investigation whether the selected environmental factors had influence on the socio-economic structure of Çankırı villages in 1980.

- There is an influence of environmental parameters used, on socio-economic development, although not very much, considering the year 1980.

- The models generated were not statistically significant in general, due to several parameters. (Although the whole regression line is found significant) However, it is possible to create a model

According to the results, there is little influence of these parameters, or at least, of the ones that were used in this analysis. However it is possible that, there could be other linear combinations of the raw data, which could provide a better relationship with the natural forces. Or similarly, the lack of strength in the relationship could be explained by the missing ultimate factors like climatic conditions, for which the data was not available and difficult to quantify. Mentioning on the data, the acquisition of the independent variables, or in other words, environmental variables may be criticized as being over simplistic. Using the mean value of elevation, slope and selected aspect may not reflect the real situation therefore being over simplistic, since for example, the very sloppy or rocky areas were not necessarily had to be exploited. Likewise, the assumption that, each village is only survived upon the land it was given, and this land was fully utilized may not be a valid one. Although spatial statistical techniques include neighborhood information, there is no limitation on distant outside effects.

The section related to the power of culture in Chapter can put light on the results as well. This part emphasizes the importance of culture for explaining the human development. Similarly, the lack of a strong relationship in these analyses can be explained with different cultural values in the region. Another likely answer to the question of “why the relationship was found to be too weak” would be: Because the proximate factors have taken the place as the major force instead of ultimate factors. Anatolia is a place which was constantly exposed to changes throughout the history. It has been occupied by many different civilizations; therefore it has been a home to people from different ethnicities with major achievements as well as destructions. So it could be concluded that this part of the world has been having a very dynamical history that has been influenced heavily by outside factors. Therefore, they are the proximate factors that were probably originated outside Anatolia as the consequences of some ultimate and other proximate factors, and then brought to Anatolia. But the main role of the environments comes at the early stages of the development of the society, as Diamond (1997) notes as ultimate factor. Whether there are easily exploitable resources like the available agricultural crops and domesticated animals are the key elements that let the technological advances be possible. Or at the micro scales, the strategic centers might have boosted the development of some particular villages.

The possible reasons can be summarized as follows:

1. Not all the external forces were included. (e.g. Climate)
2. There might be errors during data collection related to accuracy issues.
3. Dozens of completely different socio-economic indices can be produced as the linear combination readily available data. All of those indices would produce different models.
4. Some assumptions made are not much realistic. (A village exploits all of the land within its boundary)
5. The strength of natural environment's influence on societies has decayed over time.
6. Culture also has a role.
7. A perfect relationship between the physical environment and the socio-economic structure can not be expected. (Due to other proximate factors like proximity to important centers, policy etc., as well as the indeterminable nature of human beings)

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

This study is carried out in Çankırı region to assess the relationship between socio-economic structure and natural environmental parameters. The underlying idea is the geographic causation, that, the environment has an influence in shaping the human societies, especially the socio-economic dimension in this case. In this respect, the study consisted of two literature review chapters, Chapter II and Chapter III. Chapter II related to the affect of geography on the human progress. However it is also discussed in Chapter II that, environment is not the only explanatory factor. The actual aim is therefore, to seek for the effect of the environment among all other factors. Here it should be noted that, only topographical and soil characteristics were taken into account. Chapter III is about the data analysis, and especially about its spatial dimension to discover the relationships which are assumed to exist in the study area.

A total 331 village settlements are evaluated in the analyses, which are included in Chapter IV. Socio-economic data, village boundary data, topographic data and land capability data are the main input sets. The method is composed of three main steps. In the first step, socio-economic status score as the dependant variable is calculated using the rural survey made in 1980. In the second step, the independent variables which are topographic and land capability parameters are obtained. The third step includes the analyses of the relationship between the dependant and independent variables.

One main conclusion is derived after the analyses are completed. This conclusion is that, there is a limited relationship between socio-economic status and some topographical parameters. The other findings of Chapter IV are as follows.

- In this relationship, mean slope has an affect ranging from 0.007 to 0.036 in GWR analysis. For global regression analyses (both spatial and non-spatial), the mean slope parameter has been found statistically significant at 0.05. The coefficient of the mean slope varies between 0.021 and 0.033 in those analyses.

- Mean elevation has an affect ranging from -0.028 to 0.043 in GWR analysis. However, for all of the global regression analyses except spatial regression analysis with moving average model applied to logarithmically transformed index (where the coefficient is 0.0007), the mean slope parameter has been found statistically insignificant at 0.05.

- Mean aspect has an affect ranging from 0.00028 to 0.00084 in GWR analysis. Only for non-spatial regression analyses, the mean slope parameter has been found statistically significant at 0.05. The coefficient of the mean slope is 0.00048 for the initial index and 0.00047 for logarithmically transformed index in those analyses.

- Ratio of high capable soil has an affect ranging from 0.20 to 1.87 in GWR analysis. For global all regression analyses except spatial regression analyses with SAR models, ratio of high capable soil parameter has been found statistically significant at 0.05. The coefficient of the mean slope varies between 0.663 and 1.352 in those analyses.

It should be remembered that all the analyses were made intending that the calculated socio-economic index reflects the real situation. As a result, the parameters which are expected to affect socio-economic structure do not explain this socio-economic index well.

It is important to emphasize that this study is first of all an interdisciplinary one, for deriving ideas from social sciences, and adopting them to the analytic and technical applications. Second, it is a comprehensive one for embodying a series of powerful analyses making it a composite or multistage study. Application of principle components analysis (PCA) on data, which are classified by expertise oriented methods, for socioeconomic index determination is alone of great worth. Additionally, among many other analyses, application of geographically weighted regression and spatial regression are also very crucial, not for merely their being very powerful and efficient, but also for being recent techniques.

6.2. Recommendations

The relationship between socio-economic structure and natural environmental factors have been explored with simplified measures of environmental parameters, such as mean slope, elevation, aspect and proportion of high capable soil. It is important to note that all these factors were used as completely separate independent variables. These factors could be integrated to analysis in a combined manner, for example using the ratio of high capable soil where the slope is below a predefined threshold.

One other alternative could be integration of climatic conditions, such as parameters derived from temperature, rainfall, humidity etc. factors. However, the problem here might be what parameter to select. For example, if temperature is to be used, shall the mean temperature for a month, or whole year, or alternatively the variations of temperatures for different periods. In addition to climatic conditions, availability to resources, not only the precious ones, but also basic ones like water could be used.

Lastly, it is not logical to expect the same strength of relationships between the socioeconomic status and same environmental factors for every region. Some regions are more affected from other factors like proximity to strategic points and other developed communities. Therefore, it is the best to select relatively more primitive and isolated communities for analysis to avoid other factors interfere.

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APPENDIX A

The Tabular Data Source: Rural Survey made in 1980 by Rural Services Office (16 pages)

T.C.
KÖYİŞLERİ VE KOOPERATİFLER BAKANLIĞI
TOPRAK VE İSKAN İŞLERİ GENEL MÜDÜRLÜĞÜ
PLANLAMA DAİRESİ BAŞKANLIĞI

ATATÜRK'ÜN DOĞUMUNUN 100. YILI
100
1881-1981

1 9 8 1 K Ö Y E N V A N T E R E T Ü D Ü
A N K E T İ

Köy Envanter Etüdü Anket Çalışmaları, 12.6.1962 tarih ve 53 sayılı Yasa hükümlerince Devlet İstatistik Enstitüsü Başkanlığının izni ve yakın işbirliği ile Toprak ve İskan İşleri Genel Müdürlüğü tarafından yürütülmektedir.

İLİ : ÇANKIRI

İLÇESİ : ILGAZ

BUCAĞI : MERKEZ

KÖYÜ : YERKUYU

KÖYÜN ESKİ ADI (VARSA) : ....

I - GENELLİKLER

1.KÖYÜN YÜZÖLÇÜMÜ	..17613....... Dekar (1.000 m2)

2.KÖYÜN GENEL TOPOĞRAFİK DURUMU VE RAKIMI	% 25. Düz (0-2 meyil) % .... Dik (12-20 meyil) % 40. Hafif (2-6 meyil) % .... Çok Dik (20-30 meyil) % 35. Orta (6-12 meyil) % .... Sarp (30- meyil) RAKIM .830... metre

3.KÖYDE İKLİM VE EKİM DURUMU

Donlu Gün Sayısı ...120..... gün — Kırağının İlk Düştüğü Ay Ekim.... — Karın İlk Yağdığı Ay .KASIM.....

			Başı	Ortası	Sonu
Hakim Rüzgârlar	1.Yazın .POYRAZ..... Kışın .KARAYEL...				
İlkbaharın son donları	2. ..Mart....	ayının	☐ 1	☒ 2	☐ 3
Sonbaharın ilk donları	3. ...Kasım.....	ayının	☐ 1	☒ 2	☐ 3
	Ürünün Cinsi- BUĞDAY				
Kışlık ekime başlama zamanı	4. ..EKİM......	ayının	☒ 1	☐ 2	☐ 3
Kışlık ekimin sona erme zamanı	5. ..Ekim.....	ayının	☐ 1	☐ 2	☒ 3
Kışlık ekimin erme (hasat) zamanı	6. ..TEMMUZ.	ayının	☐ 1	☒ 2	☐ 3
	Ürünün Cinsi- Darı(?)				
Yazlık ekime başlama zamanı	7. ..MART.....	ayının	☐ 1	☐ 2	☒ 3
Yazlık ekimin sona erme zamanı	8. ..NİSAN....	ayının	☐ 1	☒ 2	☐ 3
Yazlık ekimin erme (hasat) zamanı	9. ..Ağustos..	ayının	☐ 1	☐ 2	☒ 3

4.KÖYÜN TİPİ VE KONUMU

Tipi

Yolboyu	Toplu	Dağınık	Seyrek	
☐ 1	☒ 2	☐ 3	☐ 4	

Konumu

Nehir kenarında	Ovada	Sırtta	Vadide	Etekte
☐ 1	☐ 2	☒ 3	☐ 4	☒ 5
Dağ Köyü	Orman Bitişiği	Orman İçi	Ormana 10. Km.	Sahil köyü
☐ 6	☐ 7	☐ 8	☐ 9	☐ 10

5.KÖY BİRDEN FAZLA YERLEŞİM YERİNDEN OLUŞUYORSA	Kom ☐ 1 Oba ☐ 2 Mezra ☐ 3 Mahalle ☐ 4 Divan ☐ 5 Dam ☐ 6 ...... ☐ 7
(Kom, Oba, Mezra, Mahalle, Dam vb) BUNLARIN DAĞILIMI	Adı .... Hane sayısı .... Adı .... Hane sayısı .... Adı .... Hane sayısı .... Adı .... Hane sayısı .... Köydeki toplam hane sayısı : ..38.......

6.KÖYDEKİ DOĞAL VE TARİHİ DEĞERLER	☐ Av sahası	☐ Plaj
	☐ Turistik orman	☐ Sifalı ılıca
	☐ Mesire yeri	☐ Şifalı içmece
	☐ Eski eserler	☒ Ziyaretgah
	☐ Kayak tesisleri	☐ ....

7.KÖYDEKİ YERALTI ZENGİNLİKLERİ

	İşletilen Kamu	İşletilen Özel	İşletilmeyen
Linyit	☐ 1	☐ 10	☐ 19
Tabii gaz	☐ 2	☐ 11	☐ 20
Krom	☐ 3	☐ 12	☒ 21
Kükürt	☐ 4	☐ 13	☐ 22
Civa	☐ 5	☐ 14	☐ 23
Bakır	☐ 6	☐ 15	☐ 24
Gayzen	☐ 7	☐ 16	☐ 25
....	☐ 8	☐ 17	☐ 26
....	☐ 9	☐ 18	☐ 27

II. ALT YAPI DURUMU

8.KÖY HALKININ SAHİP OLDUĞU MOTORLU TAŞIT ARAÇLARI

		Otobüs	Minübüs	Otomobil	Cip	Kamyon	Pikap	Traktör	Motosiklet	....
Toplam taşıt araçları	1.	-	-	-	-	-	-	7	2	.....
Köy ile bağlı bulunduğu merkez arasındaki çalışanların sayısı	2.	-	-	-	-	-	-	7	2	....

9. KÖY HALKININ EN ÇOK İLİŞKİDE BULUNDUĞU MERKEZLER

U L A Ş I M   D U R U M U

	MERKEZİN ADI	YOLUN CİNSİ: Karayolu 1 / Denizyolu 2 / Akarsu 3 / Demiryolu 4	Uzunluğu (km)	KARAYOLU DURUMU: Asfalt 1 / Stabilize 2 / Sanat Ya.lı 3 / San.Yapısız 4 / Patika 5	İLİŞKİ NEDENİ: Mal Alımı 1 / Mal Satımı 2 / Çalışma 3 / Aktarma 4 / Sağlık 5 / Kültürel 6 / Turistik 7 / .Adarı... 8	GEÇİT VERMEDİĞİ ZAMAN: Kış 1 / İlkbahar 2 / Yaz 3 / Sonbahar 4	VERMİYORSA NEDENİ: Su Basması 1 / Toprak Ky. 2 / Köprü Yok. 3 / Kar Kapam. 4 / Çığ Tıkam. 5 / Yol Yokluğu 6 / 7
Köy	1...........						
Bucak	2...........						
İlçe	3...........						
İl	4...........						
KÖYÜN İDARİ MERKEZE BAĞLANTISI							
İl	5. Eskişehir	X 1		X 1, X 2	X 3, X 4, X 5, X 6, X 7, X 8	X 1	X 4
İlçe	6. Mihalıççık	X 1		X 1, X 2	X 5, X 8	X 1	X 4
Bucak	7. Beylikova	X 1		X 2	X 1, X 2, X 4, X 5, X 6	X 1	X 4

İLİŞKİDE BULUNDUĞU, İDARİ YÖNDEN BAĞLI BULUNDUĞU YERLEŞİM YERLERİ ARASINDA KÖPRÜ VARSA

MERKEZİN ADI	KÖPRÜNÜN CİNSİ: Betonarme / Çelik / Ahşap / Kargır / Çelik Halat	Uzunluğu (m)	Genişliği (m)	Gabari Yükseklik (m)	Taşıma Kapasitesi (ton)	DURUMU: İyi 1 / Kötü 2
8. Beylikahır	X Betonarme	30 m	6 m	.....	30 t	X 1 (İyi)
9..........	... .	......	.....	.....	....	1 / 2
10..........	... .	......	.....	.....	....	1 / 2
11..........	... .	......	.....	.....	....	1 / 2

10 - KÖYÜN İÇME VE KULLANMA SUYUNUN DURUMU	**KÖYDE İÇME SUYU VARSA**
	Bakteriolojik muayenesi yapıldı mı? Evet ☒ 1 Hayır ☐ 2
	Dezenfekte ediliyor mu? Evet ☐ 1 Hayır ☒ 2
Tesisi Yapan	YSE ☒ 1 Köylü ☐ 2 ☐ 3
Kaynak	Memba ☒ 1 Deresuyu ☐ 2 Göl ☐ 3 Kuyu ☐ 4
İsaledeki boru cinsi	Künk ☐ 1 Eternit ☐ 2 Demir ☐ 3 Plastık ☒ 4
Depo hacmi	Gömme ..-..... ton Ayaklı ..-....... ton
Kuyu cinsi	Keson ☐ 1 Sondaj ☐ 2 Drenaj ☐ 3
Çeşme sayısı	Depolu .... adet Deposuz ..1.. adet Akan .1. adet Akmayan ...-..adet
Şebeke durumu	Var ☐ Yok ☒
İçme, Kullanma suyu	Yeterli ☐ Yetersiz ☒
İçme ve kullanma suyu aynı mı?	Evet ☒ Hayır ☐
	KÖYDE İÇME VE KULLANMA SUYU YOKSA
2 İçme suyu nereden sağlanıyor?	Dere ☐ 1 Göl ☐ 2 Sarnıç ☐ 3 ~~Taşıma~~ ☐ 4 .... ☐ 5
Kullanma suyu nereden sağlanıyor?	Dere ☐ 1 Göl ☐ 2 Sarnıç ☐ 3 Taşıma ☐ 4 .... ☐ 5
3 Hayvan sulama suyu nereden sağlanıyor?	Köy içme suyundan ☒ 1 Köy sulama suyundan ☐ 2 Hayvan içme suyu göletinden ☐ 3 Mer'a ve otlaktaki hayvan içme suyu göletinden ☐ 4
11 - KÖYDEKİ TARIMSAL AMAÇLI SULAMANIN DURUMU	**KÖYDE SULAMA TESİSLERİ VARSA**
1 Suyun kaynağı	Gölet ☐ Havuz ☐ Bent ☐ Kaptaj ☐ Cazibeli ☒ Pompaj ☒ Artezyen ☐ ..... ☐
Tesisi yapan ve sulanan arazi miktarı	Devlet ☐ 1 .... dekar Köylü ☒ 2 ...300... dekar
Sulamadan doğan çoraklaşma var mı?	Yok ☒ 1 Var ☐ 2 .... dekar
	KÖYDE SULAMA TESİSLERİ YOKSA
2 Sulama suyu nereden bulunabilir?	Akarsu ve göl ☐ 1 Kanal ☐ 2 Göl ☐ 3 Yeraltı suyu ☐ 4 .... ☐ 5
Nasıl sağlanabilir?	Kanalla ☐ 1 Pompajla ☐ 2 Artezyen ☐ 3 .... ☐ 4

12.KÖYDE ELEKTRİK DURUMU	KÖYDE ELEKTRİK VARSA		
Köye elektriğin geliş tarihi	Yıl ..1980....	Ay ...ŞUBAT	
Kaynağı	Dizel ☐	.... kw	
	Ulusal elektrik sistemi	☒	Trafo adedi ...1...
	Hidroelektrik sistemi	☐	.... kw

III - EKONOMİK DURUMU

13.ARAZİNİN KULLANIMI VE MİKTARI

Kültüre elverişli arazi

Çayır	Mera	Orman	Fundalık
.... dekar	11.613 dekar	...... dekar	.... dekar

Nadaslı Ku.Ta.	Nadassız Ku.Ta.	Sulu Tar.	Bahçe	Bağ
05 .5675.dekar	..—... dekar	67 .300 dek.	..—..dek.	—.dek.

Çay	Fındık	Zeytin	Antep fıstığı	Kavak
.— dek.	..—. dek.	.—.. dek.	.... dekar	..—.. dekar

Kültür dışı arazi

Yerleşim yeri	Su düzeyi	Irmak yatağı	Bataklık-Sazlık
01 ...25.... dekar	..—.. dekar	..—.. dekar	...—... dekar

Sahil kumları	Kara kumları	Kayalık	....
...—... dekar	...—... dekar	.—. dekar	.—.. dek.

14.KÖYDEKİ VAKIF VE HAZİNE ARAZİSİNİN DURUMU

Kültüre elverişli işgalli Hazine arazisi	...... Parça	.... Dekar
Kültüre elverişli boş Hazine arazisi	...... Parça	.... Dekar
Hazine ve şahıslar arasındaki ihtilaflı arazi	...... Parça	.... Dekar
Vakıf arazisi	...... Parça	.... Dekar

15. KÖYDEKİ AİLELERİN SAYISI VE KÜLTÜR ARAZİSİNİN AİLELERE DAĞILIŞI

Toplam aile sayısı : ...59....... adet

Topraklı çiftçi ailesi sayısı : ...38....... adet

Topraksız çiftçi ailesi sayısı: ...20...... adet

Topraklı çiftçi ailelerinin arazi dağılımı

	Arazi varlığı dekar	Aile sayısı	Parça sayısı	Toplam dekar
1	0 - 25	10	40	250
2	26 - 50	4	15	90
3	51 - 100	9	110	850
4	101 - 200	12	160	2160
5	201 - 500	3	50	1100
6	501 -1000	—	—	—
7	- 1000	—	—	—

Köyde arazisi olup da köy dışında yerleşen ailelerin arazi dağılımı

	Arazi varlığı dekar	Aile sayısı	Parça sayısı	Toplam dekar
1	0 - 25	5	20	60
2	26 - 50	5	15	200
3	51 - 100	10	30	800
4	101 - 200	2	17	465
5	201 - 500	—	—	—
6	501 -1000	—	—	—
7	- 1000	—	—	—

16. TOPRAK ÖLÇÜM ÇALIŞMALARI

Toprak Komisyonu uygulama yapmışsa sistemi: Mevzii ☐ Kadastral ☐

Dağıtılan arazi miktarı: .... dekar

Tahsis edilen mera: .... dekar

17. VERGİ KAYITLARI

Vergi kayıtlarına göre arazi parçası: .512... adet

Vergide kayıtlı arazinin alan toplamı: 5034... dekar

18. MERA VE YAYLAKLARDAN YARARLANMA	Köyün Adı	Uzaklığı(Km)	İhtilaflı	İhtilafsız
Köyün hayvanları başka bir köyün mera ve yaylağından yararlanıyorsa	1.	....	....	....
	2.	....	....	....
	3.	....	....	....
Başka köylerin hayvanları bu köyün mera ve yaylağından yararlanıyorsa	1.	....	....	....
	2.	....	....	....
	3.	....	....	....

19. KÖYDE PAZAR, PANAYIR DURUMU	Pazar kurulmuyor ☒
Kuruluyorsa	Emtia Pazarı ☐ Hayvan Pazarı ☐ Panayır ☐
	Pazar Haftalık ☐ Aylık ☐ Daha Seyrek ☐
	Panayır Haftalık ☐ Aylık ☐ Daha Seyrek ☐
Köylünün en çok gittiği pazarın yeri ve günü	Yer .BEYLİKAHIR Gün ..CUMAS...

20. KÖY HALKININ GEÇİM KAYNAKLARI (Önem Sırasına Göre)	1 [2] Tarla Ziraatı	2 ☐ Meyvecilik	3 ☐ Sebzecilik
	4 [1] Hayvancılık	5 ☐ Su Ürünleri	6 ☐ Madencilik
	7 ☐ Köy Elsanatları	8 ☐ Ziraat Sanatları	9 ☐ Orman Ürünleri
	10 ☐ Çiçek Seracılığı	11 ☐ Sebze Seracılığı	12 ☐ ....

21. KÖYÜN DIŞARIYA SATTIĞI BAŞLICA MADDELER (Önem Sırasına Göre)

M A D D E N İ N

Cinsi	Miktarı	Ölçü Birimi
1 Yapağı	2	Ton
2 Koyun	750	Baş
3 pancar	360	Ton
4	....	....

22. YETİŞTİRİLEN ÜRÜNLER VE DEKARA VERİMLERİ (Önem sırasına göre)

	Adı	Dekara Atılan Tohum Kuruda	Dekara Atılan Tohum Suluda	Dekara Verim (kg) Kuruda	Dekara Verim (kg) Suluda
1. Hububat	1. Buğday	16	30	160	200
	2. Arpa	24	36	180	220
	3.				
	4.				
2. Baklagiller	1. Fasulye	—	10	—	160
	2.				
	3.				
3. Yem Bitkileri	1. Yonca	—	5	—	1000
	2.				
	3.				
4. Endustri Bitki.	1. Pancar	—	1	—	4000
	2.				
	3.				
5. Yağlı Tohumlar	1.				
	2.				
	3.				
6. Yumru Bitkiler	1.				
	2.				
	3.				

	Ürünün Adı	Dekara Verim (Kg)
7. Sebze	1.	
	2.	
	3.	

	Ürünün Adı	Dekardaki Ağaç veya Omca Sayısı	Dekara Verim	Ölçü Birimi
8. Bağ - Bahçe	1. Üzüm	60	150	Kg 3
	2.			
	3.			
	4.			

23.KÖYDE TARIMSAL AMAÇLI KİRACILIK VE ORTAKÇILIK DURUMU	Kiracılık	Var ☐ 1	Yok ☒ 2		
	Ortakçılık	Var ☒ 1	Yok ☐ 2		

24.KÖYDE HAYVANCILIK DURUMU

İrat Hayvanları

	Sığır İneği	Manda İneği	Koyun	Keçi
Mera Hayvancılığı	70 baş	— baş	2000 baş	200 baş
Ahır Hayvancılığı	— baş	— baş	— baş	— baş

İpek Böceği	Fenni Kovan	Adi Kovan	Kümes Hayvanı
— kg	— adet	25 adet	200 adet

İş Hayvanları

Öküz	Manda	İnek	Merkep	Deve	Katır	At
— baş	— baş	— baş	10 baş	— adet	— adet	10 ad

Köyde yerleşmiş hayvan hastalığı varsa

Hastalığın Adı	1 Yıl İçinde Ölen Hayvan Sayısı	
Karabahça (Enteretoksemi)	— büyükbaş	400 küçükbaş
....	.... büyükbaş	.... küçükbaş
....	.... büyükbaş	.... küçükbaş
....	.... büyükbaş	.... küçükbaş
....	.... büyükbaş	.... küçükbaş

Köyde hayvanlar aşılanıyor mu? Evet ☒ 1 Hayır ☐ 2 Kısmen ☐ 3

25.KÖYDE GÜBRE KULLANIMI VE TARIMSAL MÜCADELE DURUMU

Bir Dekara Atılan		Gübre Kullanan Aile Sayısı
Çiftlik gübresi	Kimyevi gübre	....17......
....2.... ton	..25.... kg	....38......

Zirai mücadele yapılıyor mu?

Evet ☒ 1 Hayır ☐ 2 Kısmen ☐ 3

26.KÖYDE BULUNAN TARIMSAL ARAÇ VE GEREÇLER

	Adet		Adet
1.Kağnı	—	11.Batöz	4
2.Tekerlekli araba	4	12.Harman makinası	—
3.Döğen	—	13.Biçer bağlar	—
4.Karasaban	—	14.Traktör	7
5.Hayvan Pulluğu	5	15.Mibzer	2
6.Römork	7	16.Patates sökme makinası	—
7.Hayvanla çekilen çapa	—	17.Pancar sökme makinası	—
8.Traktör Pulluğu	7	18.Patates ekim makinası	—
9.Traktörle çeki.çapa	—	19.Pulvarizatör	1
10.Biçerdöğer	—	20. ..Vinovaöz....	4

27. KÖYDE MESKEN VE İMAR DURUMU

Oda sayılarına göre konut sayısı	1 Odalı	2 Odalı	3 Odalı	Toplam
	..-.. adet	.25. adet	..13. adet	..38 adet
Kat sayılarına göre konut sayısı	1 Katlı	2 Katlı	3 Katlı	Toplam
	.38. adet	..-... adet	-.... adet	.38. adet
Çatı sistemine göre konut sayısı	Düz	Kubbe	Beşik	
	..30. adet	..... adet	...8. adet	
Taşıyıcı sisteme göre konut sayısı	Yığma	Ahşap İskelet	Betonarme İsk.	Diğer
	..38 adet	..-... adet	-.... adet	..-.. adet
Çatı örtüsü maddesine göre konut sayısı	Kiremit	Tahta	Saz	Toprak
	..8.. adet	..-.. adet	..... adet	..30. adet
				Diğer
				..... adet

Dolgu maddesi cinslerine göre konut sayısı	Kerpiç	Tuğla	Taş	Briket	....
	.38. adet	..-..adet	.... adet	.... adet	..... adet

Konutlarda tabii ışıklandırma ve havalandırma durumu

- Pencere Var ☒ 1
- Pencere Yok ☐ 2
- .... ☐ 3

Köyde hela(WC) durumu	Ev İçindekiler	Ev Dışındakiler
	....-.... adet	...38.... adet

Konutların halihazır durumu	Sağlam	Çürük	Onarılabilir
	.28. adet	..-... adet	...10.. adet

Konutlarda kira ve Lojman durumu

Kirada oturan aile varsa sayısı ...-... adet

Lojmanda oturan aile varsa sayısı ...1.... adet

28. KÖYDE İMAR DURUMU

Köyde imar planı	Var ☐ 1	Yok ☒ 2
Köy gelişme alanı tefriki yapılmış mı?	Evet ☐ 1	Hayır ☒ 2
Yapılmamış ise buna olanak var mı?	Evet ☒ 1	Hayır ☐ 2

29.KÖYDE İNŞAAT SANATKARI VE MALZEMESİNİN DURUMU

En yakın yerden sağlanabilecek inşaat malzemesinin cinsi ve uzaklık

1.Ağaç, Kereste	60 km	6.Taşocağı	5 km
2.Kum, Kum Ocağı	5 km	7.Çakıl	8 km
3.Tuğla Ocağı	100 km	8.Kireç	15 km
4.Kil	60 km	9.Demir	100 km
5.Çimento	100 km	10.	.... km

Köyde inşaat malzemesini kullanabilecek sanatkar sayısı

1.Duvarcı	4 kişi	4.Marangoz	— kişi
2.Taşçı	4 kişi	5.Kuyucu	— kişi
3.Demirci	..... kişi	6.	.... kişi

30.KÖY HALKININ YERLEŞİM DURUMU

Köyün yerleşik nüfusu 200 kişi

Köy halkı eskiden beri mi bu köyde oturuyor?

Evet ☒ 1 Hayır ☐ 2

Köye sonradan gelmişlerse

Nereden	Ne Zaman (Yıl)	Niçin	Kaç Aile
1..........	....	....	....
2..........	....	....	....
3..........	....	....	....

Köye göçebe geliyorsa

Nereden	Ne Zaman	Niçin	Kaç Aile Geldi
4..........	....	....	....
5..........	....	....	....
6..........	....	....	....

Son 5 yıl içinde köye ailece yerleşenler

Nereden	Niçin	Kaç Aile Geldi
7..........	....	....
8..........	....	....

Son 5 yıl içinde köyden ailece göç edenler

Nereye	Niçin	Kaç Aile Gitti
9. Eskişehir	Çalışmak	8
10..........	....	....

31.KÖYDEN GEÇİCİ OLARAK AYRILANLAR VE KÖYE GELENLER	Gittikleri Yer	Aile Sayısı	Kişi Sayısı	Ayrılma Nedeni
Yurt Dışı	.Almanya....	..1..	..4...	.Çalışma...
Yurt İçi	....	......	......	....
	Köye Gelenler			Gelme Nedeni
Yurt İçi	.... ilinden	......	......	....

32.KÖYDE YAYGIN ISINMA, YEMEK PİŞİRME ARACI VE YAKIT CİNSİ

Isınma Yakıtı	Kömür [2] 1	Odun [2] 2	Petrol ☐ 3	Tezek [1] 4	..... ☐ 5	...... ☐ 6	
Isınma Aracı	Soba [1] 1	Ocak ☐ 2	Tandır [2] 3	Elk.Sob. ☐ 4	..... ☐ 5	...... ☐ 6	
Aydınlanma Aracı	Gaz Lam. [2] 1	Elek. [1] 2	Tüpgaz [3] 3	Lüks ☐ 4	..... ☐ 5	...... ☐ 6	
Yemek Pişirme Aracı	Ocak [2] 1	GazOc. ☐ 2	Tandır ☐ 3	Fırın ☐ 4	Tüpgaz [1] 5	Elk.Ocağı ☐ 6	Saç ☐ 7 ...... ☐ 8

33.KÖYDE ELEKTRİKLE ÇALIŞAN EV ALET VE ARAÇLARI

1.Radyo	..6.	adet	6.Kuluçka makinası	.—.	adet
2.Televizyon	.10	adet	7.Çamaşır makinası	..—.	adet
3.Buzdolabı	..4.	adet	8.Krema makinası	..—	adet
4.Yayık	..—	adet	9.	....	adet
5.Fırın	.2.	adet	10.	....	adet

Radyonun en çok dinlendiği saatler 7^{00}.9^{00}/..18^{00}.20^{00}.

Televizyonun en çok izlendiği saatler ..20^{00}/.23^{00}......

34.KÖYDE İNSAN SAĞLIĞI İLE İLGİLİ DURUM

Köyde yerleşmiş bulaşıcı hastalık varsa: Sıtma ☐ 1 Trahom ☐ 2 Cüzzam ☐ 3 Verem ☐ 4 ...... ☐ 5 ..... ☐ 6 ...... ☐ 7

Köyde diğer yöresel hastalık varsa adlarını yazın: ....

Köyde tarım mücadele ilacından zehirlenme oldu ise: Kaç kişi zehirlendi ..—... Kaç kişi öldü ...—.....

Köydeki sakatların çeşit ve sayıları

	Doğuştan	Sonradan		Doğuştan	Sonradan
Kör	.—. kişi	.—. kişi	Sağır	..—. kişi	.—. kişi
Topal	.—. kişi	.—. kişi	Dilsiz	.—. kişi	.—.. kişi
Kötürüm	.... kişi	.1. kişi	Akıl Hs.	..— kişi	.—.. kişi
			......	.... kişi	.... kişi

35.KÖYDEKİ OKUL VE ÖĞRENİM DURUMU							
Köyde okul varsa	CİNSİ	OKUL SAYISI	SINIF SAYISI	ÖĞRETMEN SAYISI	ÖĞRENCİ SA. KIZ	ÖĞRENCİ SA. ERKEK	KİTAPLIK VARSA KİTAP SAYISI
	1.İlkokul	..1..	..1...	..1...	..8.	.12.	......
	2.Orta ve Dengi	......	......	......	.....	.....	......
	3.Lise ve Dengi	.....	......	......	.....	.....	.....,
	4.Bölge Yatılı	......	......	......	.....	.....	......
	5.	......	......	......	.....	.....	......

Köyde okul yoksa ve köy çocukları başka yere okula gidiyorsa		Kaç Öğrenci	Kaç Km.Uzakta	Nereye Gidiyor
	1.İlkokul	......	......	....
	2.Orta ve Dengi	.3....	..15..	..Beylikahır
	3.Lise ve Dengi	......	......	....
	4.Bölge Yatılı	......	......	....
	5.	......	......	....

Köydeki öğrenim durumu

Köyde ilkokul çağında olupta okula gitmeyenlerin sayısı ..—.. kişi

Köyde okuma yazma bilmeyenlerin sayısı ..32. kişi

Köyde lise üstü tahsil yapanların sayısı ..1.. kişi

36.KÖYDE TARIMSAL EĞİTİM		
Köyde tarımsal eğitim görmüş oturan kimse var mı?	Var ☐ 1	Yok ☒ 2
Varsa Nerede Eğitim Görmüşlerdir	OKULDA .... kişi	KURSTA .... kişi

37. KÖYDE BULUNAN SOSYAL VE EKONOMİK TESİSLER (Sayı olarak)

1.Belediye	-	8.Cami	-	16.Umumi WC	-
2.Karakol	-	9.Mescit	+1	17.........	....
3.PTT	-	10.Kilise	-	18.........	....
4.Sağ.Ocağı	-	11.Hamam	-	19.........	....
5.Sağlık Evi	-	12.Çamaşırhane	-	20.........	....
6.Köy Grup Ebeliği	-	13.Köy Odası	-	21.........	....
7.Ana Çocuk Sağlık İşl.	-	14.Selektör	-	22.........	....
		15.Köy Kitaplığı	-	23.........	....

38. KÖYDE BULUNAN TİCARETHANELER (Sayı olarak)

1.Kahve	-	7.Kitapçı	-	15.Otel	- .... yatak
2.Motorlu Değirmen	-	8.Manav	-	16.Motel	- .... yatak
3.Su Değirmeni	-	9.Kasap	-	17.Vasıta İşletmesi	-
4.Yel Değirmeni	-	10.Han	-	18.Soğuk hava Deposu	-
5.Fırın	-	11.Berber	-	19........	....
6.Bakkal	-	12.......	....	20........	....
		13.......	....		
		14.......	....		

39. KÖYDE BULUNAN İMALATHANE VE BENZERİ YERLER

	Adet	Çalışan Kişi		Adet	Çalışan Kişi
1.Taş Ocağı	....	......	9.Mandra	....	......
2.Maden Ocağı	....	......	10.Halı Kilim Atelyesi	....	......
3.Mensucat	....	......	11.Ağaç İşleri	....	......
4.Dericilik	....	......	12.Demir Metal İşleri	....	......
5.Tuğla Kiremit Briket İmali	....	......	13.İçki İmalatı	....	......
6.Konserve İmalatı	....	......	14............	....	......
7.Toptancılık	....	......	15............	....	......
8.Tütün Atelyesi	....	......	16............	....	......

40. KÖYE GELEN GEÇİCİ KAMU HİZMETLERİ

	Kaç Kez	Kaç Kişi		Kaç Kez	Kaç Kişi
1.Gezici Sağlık Memuru	3	2	6.Hayvan Sağlık Mem.	1	2
2.Gezici Dikiş Kursu	-	-	7.Elsanatları Kursu	-	-
3.Aile Planlama "	-	-	8.Tarım Kursu	-	-
4.Kuran Kursu(Resmi)	-	-	9.İmam	-	-
5.Korucu	-	-	10.	....	....

Köydeki daimi kamu görevlileri: 1.Korucu ..1... kişi 2.İmam ..1... kişi 3. .... kişi

41.KÖYDE KOOPERATİFLEŞME

KÖYDE KOOPERATİF VARSA

1.Kooperatif

Adı	Tarım Kredi	Tarım Satış	Köy Kalkınma	Üretim	Bağlı olduğu Birlik
....	☐1	☐2	☐3	☐4	☐5...........

Kredi almış ise alınan kuruluşun adı ....

Kooperatiften kredi alanların sayısı .... Toplam kredi ....

Kooperatif ortak sayısı .... Kuruluş yılı ....

Çalışan İşçi Sayısı Sürekli .... Geçici ....

Faaliyet alanına giren yerleşim yeri sayısı ....

Kooperatifin uyguladığı projenin konusu ....

Kamu kuruluşlarından alınan proje işletmeye geçirilebildi mi?

Evet ☐1 Hayır ☐2

2.Kooperatif

Adı	Tarım Kredi	Tarım Satış	Köy Kalkınma	Üretim	Bağlı olduğu Birlik
....	☐1	☐2	☐3	☐4	☐5............

Kredi almış ise alınan kuruluşun adı ....

Kooperatiften kredi alanların sayısı .... Toplam kredi ....

Kooperatif ortak sayısı .... Kuruluş yılı ....

Çalışan İşçi Sayısı Sürekli.......... Geçici ....

Faaliyet alanına giren yerleşim yeri sayısı ....

Kooperatifin uyguladığı projenin konusu ....

Kamu kuruluşlarından alınan proje işletmeye geçirilebildi mi?

Evet ☐1 Hayır ☐2

3.Kooperatif

Adı	Tarım Kredi	Tarım Satış	Köy Kalkınma	Üretim	Bağlı olduğu Birlik
....	☐1	☐2	☐3	☐4	☐5 ....

Kredi almış ise alınan kuruluşun adı ....

Kooperatiften kredi alanların sayısı .... Toplam kredi ....

Kooperatif ortak sayısı .... Kuruluş yılı ....

Çalışan İşçi Sayısı Sürekli .... Geçici ....

Faaliyet alanına giren yerleşim yeri sayısı ....

Kooperatifin uyguladığı projenin konusu ....

Kamu kuruluşlarından alınan proje işletmeye geçirilebildi mi?

Evet ☐1 Hayır ☐2

42. KÖYDEKİ KÖY BİRLİKLERİNİN DURUMU

Köyünüzde Köy Kanununa göre kurulmuş birliklerden hangileri vardır?

		Kuruluş Yılı	Bağlı Olduğu Merkez
Su birliği	☐ 1	....	....
Yol birliği	☐ 2	....	....
Telefon "	☐ 3	....	....
Elektrik "	☐ 4	....	....
Damızlık "	☐ 5	....	....
Fidanlık "	☐ 6	....	....

43. KÖYÜN BÜTÇE VE İMECE DURUMU

Köyün bütçesi kaç TL'dir? 10.000 TL.

Köy işleri için imece yapılıyor mu? Evet ☒ 1 Hayır ☐ 2

Köyde aileler arası imece yapılıyor mu? Evet ☐ 1 Hayır ☒ 2

44. YAŞLILARA YAPILAN SOSYAL YARDIM

Köyde 65 yaşın üstünde olanların sayısı? .....5.............

Köyde 100 yaşın üstünde olanların sayısı? .....-.............

Köyde Devletten sosyal yardım alanların sayısı? .....6.............

45. KÖY YETKİLİLERİNİN EN ÖNEMLİ GÖRDÜK-LERİ ÜÇ SORUN (Önem sırasına göre)

1. SULAMA SUYU ŞEBEKESİ YAPIMI
2. KUMLUK DERESİNE KÖPRÜ YAPIMI
3. KÖY KONAĞI YAPIMI

46. KÖY VE KÖYLÜ HAKKINDA BU ANKETTE SORULMAMIŞ BİLGİLERDEN ANKETÖRCE KAYDA DEĞER BULUNAN BİLGİLER

1- Resmi kayıtlarda 5.800 dk. itirazsız Hz. vardır

BİLGİ ALINAN KAMU KURULUŞLARI

1. Toprak-İskân
2. Tapu sicil Müh.
3. Milli emlâk ve Vergi D.

APPENDIX B

Table B.1. The list of the variables in the whole database, including 195 variables, which are classified into economy, social and service groups.

VARIABLES OF THE ECONOMIC GROUP

VARIABLE NAME	VARIABLE EXPLANATION
BUS	Number of buses
MINIBUS	Number of minibuses
CAR	Number of cars
JEEP	Number of jeeps
TRUCK	Number of trucks
PICKUP	Number of pickup trucks
TRACTOR	Number of tractors
MOTORBIKE	Number of motorbikes
T_VILLAGE	Total area of irrigated land, provided by villagers (in hectares)
MEADOW	Total area of meadow lands
PASTURE	Total area of pasture lands
FOREST	Total area of forest lands
HEATH	Total area of heath lands
FALLOW	Total area of land unsown or left fallow, to prepare it for planting in the next years
SOWNLAND	Total area of sown lands for every year
IRRIGATEDL	Total area of irrigated lands
GARDEN	Total area of garden lands
VINEYARD	Total area of vineyards
HAZEL	Total area of hazel lands
POPLAR	Total area of poplar lands
SETTLEMENT	Total area of settlement
WATERBODY	Total area of waterbodies
STREAM	Total area of streams
SBULL	Total number of bulls sold last year
SSHEEP	Total number of sheep sold last year
SGOAT	Total number of goats sold last year
WHEAT	Total amount of wheat sold (in tons)
BARLEY	Total amount of barley sold (in tons)
CVETCH	Total amount of common vetch sold (in tons)
SBEET	Total amount of sugar beet sold (in tons)
AWOOL	Total amount of Angora wool sold (in kilos)
WOOL	Total amount of wool sold (in kilos)
LENTIL	Total amount of lentils sold (in kilos)
APPLE	Total amount of apples sold (in kilos)
BEAN	Total amount of beans sold (in tons)
POTATO	Total amount of potatos sold (in tons)
TOMATO	Total amount of tomatos sold (in tons)
RICE	Total amount of rice sold (in tons)
CABBAGE	Total amount of cabbages sold (in tons)

Table B.1. (Continued)
VARIABLES OF THE ECONOMIC GROUP

VARIABLE NAME	VARIABLE EXPLANATION
HONEY	Total amount of honey sold (in kilos)
WALNUT	Total amount of walnuts sold (in tons)
CHERRY	Total amount of cherries sold (in kilos)
ONION	Total amount ofonions sold (in tons)
CHEESE	Total amount of cheese sold (in tons)
FPASTE	Total amount of fruit paste sold (in tons)
PEAR	Total amount of pears sold (in tons)
CUCUMBER	Total amount of cucumbers sold (in tons)
WMELON	Total amount of water melons sold (in tons)
MELON	Total amount of melons sold (in tons)
SUNFLOWER	Total amount of sunflowers sold (in tons)
EGGPLANT	Total amount of eggplants sold (in tons)
MILK	Total amount of milk sold (in tons)
CHICKPEA	Total amount of chickpeas sold (in tons)
PEPPER	Total amount of peppers sold (in tons)
BULL	Total amount of bulls maintained
WBUFFALO	Total amount of water buffalos maintained
SHEEP	Total amount of sheep maintained
GOAT	Total amount of goats maintained
SILK	Total amount of silk produced (in tons)
AHIVE	Total number of advanced hives available
OHIVE	Total number of ordinary hives available
HENHOUSE	Total number of henhouses hives available
OXW	Total number of oxes as work force
WBUFFALOW	Total number of water buffalos as work force
COWW	Total number of cows as work force
DONKEYW	Total number of donkeys as work force
CAMELW	Total number of camels as work force
MULEW	Total number of mules as work force
HORSEW	Total number of horses as work force
OXCART	Total number of oxcarts
SCART	Total number of single carts
DOGEN	Total number of döğens (Döğen: A cart pulled by oxes to tresh grain)
CPLOW	Total number of classic plows
MPLOW	Total number of modern plows
TRAILER	Total number of trailers
OXANCHOR	Total number of anchors which are pulled by ox
TPLOW	Total number of tractor plows
TANCHOR	Total number of anchors which are pulled by tractor
CHARVESTER	Total number of combine harvesters
BATOZ	Total number of batoz tools
TMACHINE	Total number of treshing machines
RBINDER	Total number of rieper binders
SOWER	Total number of mibzers. (Mibzer is a tool for sowing seeds)
PULVARIZATOR	Total number of pulvarizator machines
SICKLEM	Total number of sickle machines

Table B.1. (Continued)

VARIABLES OF THE ECONOMIC GROUP

VARIABLE NAME	VARIABLE EXPLANATION
KAZAYAGI	Total number of kazayağı machines
WATERPUMP	Total number of water pumps
OM	Total number of om tools
KULTUVATOR	Total number of kultuvator machines
RADIO	Total number of radios
TV	Total amount of televisions
FRIDGE	Total amount of fridges
CHURN	Total amount of churns
OVEN	Total amount of ovens
INCUBATION	Total number of incubation machines
CAMASIR MAK.	Total number of washing machines
CREAM	Total number of cream machines
IRON	Total number of irons
SHAVE	Total number of shaving machines
GRILL	Total number of grill machines
HDRIER	Total number of hair drying machines
CPLAYER	Total number of casette players
WMACHINE	Total number of welding machines
BULGURM	Total number of bulgur machines

VARIABLES OF THE SERVICE GROUP

VARIABLE NAME	VARIABLE EXPLANATION
CONCRETEB	Total number of concrete bridges
STEELB	Total number of steel bridges
WOODENB	Total number of wooden bridges
MIXEDB	Total number of bridges with mixed materials
VWDEPOT	The volume of water depot (in meter cubes)
PSCHOOL	Total number of primary schools
PCLASS	Total number of classes in primary schools
PTEACHER	Total number of teachers in primary schools
PGIRL	Total number of female students in primary schools
PBOY	Total number of male students in primary schools
PBOOK	Total number of books in primary schools' libraries
MUNICIPALITY	Municipality
POLICE	Police office
POST	Post office
VCLINIC	Village clinic
SCLINIC	Smaller clinic
MWSERVICE	Midwife service
MCSERVICE	Mother and child health service
MOSQUE	Mosque
SMOSQUE	Small mosque
CHURCH	Church
PBATH	Public bath
LAUNDERETTE	Launderette
PVROOM	Public village room
SELEKTOR	Selector

Table B.1. (Continued)

VARIABLES OF THE SERVICE GROUP

VARIABLE NAME	VARIABLE EXPLANATION
PLIBRARY	Public library
PWC	Public water closet
VPALACE	Village palace
QCOURSE	Quran course
AGENCY	Agency
FENGINEER	Forest engineer
T_STATE	Total amount of irrigated land, provided by the state (in hectares)
FDEPOT	Fountains with depots
FNDEPOT	Fountains without depots
FWORK	Fountains working well
FNWORK	Fountains not working

VARIABLES OF THE SOCIAL GROUP

VARIABLE NAME	VARIABLE EXPLANATION
HFIELD	Hunting field
TPLACE	Touristic place
ESPOT	Excursion spot
APLACE	Archeological places
HSPRING	Healing spring
HFOUNTAIN	Healing fountain
ZIYARETGAH	Ziyaretgah
MAUSOLEUM	Mausoleum
SWATER	Soda water
HMOSQUE	Historical mosque
SALTPAN	Saltpan
LANDLORDS	Number of households owning land
NLANDPPL	Number of households not owning land
025FAM	Number of families owning land whose size is between 0 and 25 hectares
025P	Number of land pieces whose area ranges between 0 and 25 hectares
025T	Total area of lands whose size vary between 0 and 25 hectares
2650FAM	Number of families owning land whose size is between 26 and 50 hectares
2650P	Number of land pieces whose area ranges between 26 and 50 hectares
2650T	Total area of lands whose size vary between 26 and 50 hectares
51100FAM	Number of families owning land whose size is between 51 and 100 hectares
51100P	Number of land pieces whose area ranges between 51 and 100 hectares
51100T	Total area of lands whose size vary between 51 and 100 hectares
101200FAM	Number of families owning land whose size is between 101 and 200 hectares
101200P	Number of land pieces whose area ranges between 101 and 200 hectares

Table B.1. (Continued)
VARIABLES OF THE SOCIAL GROUP

VARIABLE NAME	VARIABLE EXPLANATION
101200T	Total area of lands whose size vary between 101 and 200 hectares
201500FAM	Number of families owning land whose size is between 201 and 500 hectares
201500P	Number of land pieces whose area ranges between 201 and 500 hectares
201500T	Total area of lands whose size vary between 201 and 500 hectares
5011000FAM	Number of families owning land whose size is between 501 and 1000 hectares
5011000P	Number of land pieces whose area ranges between 501 and 1000 hectares
5011000T	Total area of lands whose size vary between 501 and 1000 hectares
1000+FAM	Number of families owning land whose size is more than 1000 hectares
1000+P	Number of land pieces whose area is more than 1000 hectares
1000+T	Total area of lands whose size is more than 1000 hectares
O025FAM	Number of families (outside the village) owning land whose size is between 0 and 25 hectares
O025P	Number of land pieces owned by outsiders and whose area ranges between 0 and 25 hectares
O025T	Total area of landsowned by outsiders and whose size vary between 0 and 25 hectares
O2650FAM	Number of families (outside the village) owning land whose size is between 26 and 50 hectares
O2650P	Number of land pieces owned by outsiders and whose area ranges between 26 and 50 hectares
O2650T	Total area of landsowned by outsiders and whose size vary between 26 and 50 hectares
O51100FAM	Number of families (outside the village) owning land whose size is between 51 and 100 hectares
O51100P	Number of land pieces owned by outsiders and whose area ranges between 51 and 100 hectares
O51100T	Total area of landsowned by outsiders and whose size vary between 51 and 100 hectares
O101200FAM	Number of families (outside the village) owning land whose size is between 101 and 200 hectares
O101200P	Number of land pieces owned by outsiders and whose area ranges between 101 and 200 hectares
O101200T	Total area of landsowned by outsiders and whose size vary between 101 and 200 hectares
O201500FAM	Number of families (outside the village) owning land whose size is between 201 and 500 hectares
O201500P	Number of land pieces owned by outsiders and whose area ranges between 201 and 500 hectares
O201500T	Total area of landsowned by outsiders and whose size vary between 201 and 500 hectares
H1R	Number of houses with one room
H2R	Number of houses with two rooms
H3R	Number of houses with three rooms

Table B.1. (Continued)
VARIABLES OF THE SOCIAL GROUP

VARIABLE NAME	VARIABLE EXPLANATION
H1F	Number of houses with one floor
H2F	Number of houses with two floors
H3F	Number of houses with three floors
HADOBE	Number of houses with adobe material
HBRICK	Number of houses made by bricks
HSTONE	Number of houses made by stones
HBRIQ	Number of houses made by briquette
HWOOD	Number of houses made by wood
HWOAD	Number of houses made by wood and adobe
HSTAD	Number of houses made by stone and adobe
HRENT	Number of houses rented
HEMP	Number of houses provided for employees
POP	Population of the village
OLDS	Is the settlement an old one?
NEWS	Is the settlement a new one?
NOSCHOOL	Number of the kids that don't go to school
ILLITERATURE	Number of illiterature people
HSCHOOL	Number of people with high school degree

APPENDIX C

Table C.1. The indices for each group: economic, service and social, as well as the final composite index and the logarithmically transformed index

TOWNSHIP	VILLAGE	ID	Econ	Service	Social	Total	NTotal	LogT	NLogT
ILGAZ	MÜLAYİM	3	0,0353	0,1032	0,8720	1,0105	2,0915	0,4597	4,5975
ILGAZ	ÇOMAR	4	0,5458	0,6021	0,3772	1,5251	2,2402	0,4795	4,7945
KURŞUNLU	KAVAK	5	-0,6256	-1,1994	-0,4223	-2,2473	1,1504	0,3086	3,0864
OVACIK	SOĞANLI	6	0,1576	-0,0565	0,1574	0,2586	1,8743	0,4292	4,2924
KURŞUNLU	HARMANCIK	7	0,4324	-0,8503	-0,8760	-1,2938	1,4258	0,3586	3,5855
KURŞUNLU	ÇAYIRCIK	8	2,0063	0,5693	1,5063	4,0819	2,9788	0,5660	5,6596
KURŞUNLU	YAYLATEPESİ	9	1,2740	-0,8496	-1,3282	-0,9039	1,5385	0,3774	3,7742
KURŞUNLU	FERİZ	11	-0,0879	0,1984	-1,4047	-1,2942	1,4257	0,3585	3,5853
ILGAZ	BALCI	12	0,0839	-0,0410	0,3794	0,4222	1,9215	0,4361	4,3607
ORTA	ELDEN	13	-0,7345	0,2306	0,5257	0,0218	1,8059	0,4192	4,1918
OVACIK	ÇATAK	36	4,1941	-2,1119	1,4292	3,5115	2,8140	0,5481	5,4809
OVACIK	BEYDİLİ	46	-0,2389	-1,0849	-1,1897	-2,5136	1,0735	0,2936	2,9361
OVACIK	YÜREKÖREN	47	2,1505	-0,0811	-1,1341	0,9354	2,0698	0,4568	4,5680
ORTA	HASANHACI	66	-1,0292	0,1087	-0,5860	-1,5065	1,3644	0,3479	3,4791
ORTA	DODURGA	67	-1,3399	-0,9832	-1,0845	-3,4076	0,8152	0,2390	2,3897
ŞABANÖZÜ	BULDUK	68	-0,7976	2,1606	1,3142	2,6772	2,5730	0,5206	5,2057
ORTA	SAKAELİ	70	-0,4347	-0,7509	0,1006	-1,0850	1,4861	0,3688	3,6876
ORTA	KIRSAKAL	71	0,8792	0,4710	-0,5119	0,8383	2,0418	0,4530	4,5295
ORTA	BUĞUÖREN	72	-1,2534	1,0059	0,6137	0,3662	1,9054	0,4337	4,3375
ORTA	SALUR	76	-0,4787	2,2075	1,6322	3,3610	2,7705	0,5433	5,4326
ORTA	YENİCE	78	-1,0433	0,0760	0,9090	-0,0583	1,7828	0,4157	4,1572
ŞABANÖZÜ	GÖLPINAR	79	-1,1687	-1,1234	-0,0470	-2,3390	1,1239	0,3035	3,0352
ELDİVAN	SEYDİKÖY	83	-0,9766	-0,2002	0,1587	-1,0181	1,5055	0,3720	3,7198
ELDİVAN	ÇUKURÖZ	84	-0,4885	-0,2077	1,2505	0,5543	1,9597	0,4415	4,4150
ELDİVAN	AKÇALI	86	-0,8748	-0,0415	0,8974	-0,0189	1,7941	0,4174	4,1742
MERKEZ	KAYIÇİVİ	87	-0,8498	2,0261	3,6029	4,7791	3,1802	0,5868	5,8683
ORTA	KARAAĞAÇ	89	0,0590	-0,5655	-0,5703	-1,0768	1,4885	0,3692	3,6916
ORTA	SANCAR	90	-0,9345	0,5559	0,3912	0,0125	1,8032	0,4188	4,1878
KURŞUNLU	DUMANLI	91	-1,2057	-0,6267	-0,6283	-2,4607	1,0887	0,2966	2,9664
ŞABANÖZÜ	KAMIŞKÖY	93	-0,6191	1,1815	0,9972	1,5596	2,2501	0,4807	4,8074
MERKEZ	ÇUKURÖREN	94	-1,1874	-0,3682	0,9101	-0,6454	1,6131	0,3895	3,8949
KURŞUNLU	TAŞKARACALAR	96	-1,2850	-0,6696	-0,7215	-2,6761	1,0265	0,2842	2,8417
ORTA	DOĞANLAR	97	-1,0520	-0,3025	-1,0972	-2,4517	1,0913	0,2971	2,9715
MERKEZ	YOLKAYA	98	-0,9159	-0,9380	0,5967	-1,2572	1,4364	0,3604	3,6036
KURŞUNLU	ÇUKURCA	99	-0,2322	1,4940	0,2385	1,5002	2,2330	0,4785	4,7852
KURŞUNLU	SUMUCAK	100	-1,0434	0,8007	0,1822	-0,0605	1,7821	0,4156	4,1562
KURŞUNLU	ESKİAHIR	101	-1,0445	-0,4779	-0,1281	-1,6506	1,3228	0,3405	3,4054

Table C.1. (Continued)									
TOWNSHIP	VILLAGE	ID	Econ	Service	Social	Total	NTotal	LogT	NLogT
KURŞUNLU	YUMUKÖREN	107	-0,5073	-0,7700	0,7178	-0,5595	1,6380	0,3934	3,9343
ILGAZ	SÖĞÜTÇÜK	109	-0,2753	-0,7826	-0,9976	-2,0555	1,2058	0,3192	3,1915
ILGAZ	YENİCE	110	-0,3794	0,8710	-0,6712	-0,1795	1,7477	0,4104	4,1043
ILGAZ	İKİKAVAK	111	-0,9815	-0,2906	-0,0048	-1,2769	1,4307	0,3594	3,5939
ILGAZ	KAYI	112	-0,8952	1,6374	1,9155	2,6576	2,5673	0,5199	5,1991
ILGAZ	AŞIKLAR	113	0,6905	0,8434	-0,0599	1,4740	2,2254	0,4775	4,7753
ILGAZ	GÜNEY	114	4,2885	0,4491	1,4541	6,1917	3,5883	0,6263	6,2628
ILGAZ	KAVAKLI	115	0,0950	-0,0730	-0,3106	-0,2886	1,7162	0,4056	4,0562
ILGAZ	KIZILIBRIK	116	-0,0967	0,8614	-0,2638	0,5010	1,9443	0,4393	4,3931
ILGAZ	ÇÖREKÇİLER	117	-0,9940	-0,1510	2,0140	0,8690	2,0506	0,4542	4,5417
KURŞUNLU	BOĞAZKAYA	118	-0,3097	1,1913	-0,8063	0,0753	1,8213	0,4215	4,2147
KURŞUNLU	KOÇLU	119	-0,9508	-0,3709	-0,7331	-2,0547	1,2060	0,3192	3,1919
KURŞUNLU	SİVRİCEK	120	-1,1856	0,1226	0,7206	-0,3424	1,7007	0,4032	4,0323
KURŞUNLU	HACIMUSLU	121	-0,7059	-0,4065	-1,3363	-2,4487	1,0922	0,2973	2,9732
KURŞUNLU	ÇIRDAK	123	-0,7069	-0,5586	-0,3202	-1,5856	1,3415	0,3439	3,4388
KURŞUNLU	BELENLİ	126	-1,1500	-1,8239	-2,3526	-5,3266	0,2608	0,0916	0,9157
KURŞUNLU	SUSUZ	131	0,3006	1,5452	0,4066	2,2525	2,4503	0,5059	5,0587
KURŞUNLU	SÜNÜRLÜ	133	0,7191	0,8456	-0,2716	1,2931	2,1732	0,4707	4,7068
KURŞUNLU	ILIPINAR	134	-0,9973	-0,6315	-0,4594	-2,0881	1,1964	0,3174	3,1738
KURŞUNLU	KAPAKLI	138	1,5366	0,8559	-0,5646	1,8280	2,3277	0,4906	4,9065
KURŞUNLU	DAĞTARLA	142	-1,0918	-1,7627	-1,5841	-4,4385	0,5174	0,1660	1,6603
KURŞUNLU	BEREKET	143	-0,1542	-0,9055	-0,8393	-1,8990	1,2510	0,3275	3,2754
KURŞUNLU	KÖPRÜLÜ	147	0,5040	6,7103	0,3286	7,5429	3,9786	0,6609	6,6094
KURŞUNLU	IĞDIR	148	-1,1792	0,1174	-0,0585	-1,1204	1,4759	0,3670	3,6705
KURŞUNLU	BOZKUŞ	150	-0,1213	0,1223	-0,0545	-0,0535	1,7841	0,4159	4,1593
KURŞUNLU	KARATAŞ	151	-0,4900	-1,6654	-0,0269	-2,1823	1,1692	0,3122	3,1223
KURŞUNLU	DALKOZ	152	-1,1157	-1,4704	-0,2413	-2,8273	0,9828	0,2752	2,7521
KURŞUNLU	ÇATKESE	153	-0,6079	-1,1315	-0,9572	-2,6966	1,0206	0,2830	2,8297
KURŞUNLU	KARAKUZU	154	-0,7038	0,4708	-0,1733	-0,4063	1,6822	0,4004	4,0037
KURŞUNLU	BAŞOVACIK	155	-0,9175	-0,7177	-2,5823	-4,2175	0,5812	0,1827	1,8273
KURŞUNLU	AKGÜNEY	157	-0,1437	-0,8087	0,5661	-0,3863	1,6880	0,4013	4,0126
KURŞUNLU	YUSUFOĞLU	158	-0,1934	0,7655	0,8952	1,4672	2,2234	0,4773	4,7728
KURŞUNLU	YURTPINAR	159	-0,8999	-2,5537	-1,0061	-4,4597	0,5113	0,1644	1,6440
KURŞUNLU	OYMAAĞAÇ	162	0,3375	1,5773	1,0426	2,9574	2,6539	0,5300	5,3001
KURŞUNLU	AKSEKİ	163	-1,1608	-1,6897	1,5701	-1,2805	1,4297	0,3592	3,5921
KURŞUNLU	BAYRAMÖREN	164	-0,9773	3,9423	1,8478	4,8128	3,1899	0,5878	5,8782
KURŞUNLU	DOLAŞLAR	165	-0,8644	-0,3663	-0,8703	-2,1009	1,1927	0,3167	3,1668
KURŞUNLU	GÖYNÜKÖREN	166	0,4498	4,6530	-0,4384	4,6645	3,1471	0,5835	5,8347
KURŞUNLU	SARIKAYA	167	-0,7653	-2,5116	-1,5029	-4,7797	0,4188	0,1389	1,3891
KURŞUNLU	ÇAYLICA	169	-0,7007	0,3792	-0,8060	-1,1275	1,4739	0,3667	3,6670
KURŞUNLU	YAKALI	170	-0,4414	1,3479	0,5998	1,5063	2,2347	0,4787	4,7875
OVACIK	BELEN	172	0,9432	-0,0296	1,3123	2,2258	2,4426	0,5049	5,0492
KURŞUNLU	ÇAKIRBAĞ	179	-0,8699	-0,8972	-0,4794	-2,2466	1,1506	0,3087	3,0868
KURŞUNLU	YAZIÖREN	180	-0,4729	1,1026	-0,5895	0,0402	1,8112	0,4200	4,1997
OVACIK	ANBARÖZÜ	181	-0,6780	1,1623	-0,0329	0,4513	1,9300	0,4373	4,3727
KURŞUNLU	ÜÇGAZİ	183	-0,9646	-1,6581	-0,3584	-2,9812	0,9384	0,2659	2,6589

Table C.1. (Continued)									
TOWNSHIP	**VILLAGE**	**ID**	**Econ**	**Service**	**Social**	**Total**	**NTotal**	**LogT**	**NLogT**
KURŞUNLU	DEMİRLİ	184	-0,3571	-1,5621	-0,4524	-2,3716	1,1145	0,3017	3,0169
KURŞUNLU	YEŞİLÖZÜ	185	-0,7226	3,1735	-1,2994	1,1515	2,1322	0,4652	4,6524
KURŞUNLU	BUDAKPINARI	187	0,3810	5,8381	-0,2964	5,9227	3,5106	0,6190	6,1904
KURŞUNLU	EYÜPÖZÜ	188	-1,1364	-1,3987	0,2569	-2,2781	1,1415	0,3069	3,0693
KURŞUNLU	KÜKÜRT	191	0,2311	0,7492	-1,6781	-0,6978	1,5980	0,3871	3,8707
KURŞUNLU	DOLAP	192	-0,7294	-1,6717	-0,6716	-3,0727	0,9119	0,2603	2,6025
MERKEZ	YEŞİLYURT	193	-1,2063	-1,8332	-1,1676	-4,2071	0,5842	0,1835	1,8350
MERKEZ	SATIYÜZÜ	195	-0,5444	1,0424	-2,1055	-1,6074	1,3352	0,3428	3,4276
MERKEZ	ÇAĞABEY	199	-1,2208	-2,0979	-0,5147	-3,8334	0,6922	0,2103	2,1031
MERKEZ	BEŞDUT	201	0,1074	16,1129	5,9522	22,1725	8,2049	0,9235	9,2347
ŞABANÖZÜ	ÇAPAR	212	-0,5689	-1,8123	2,1937	-0,1876	1,7454	0,4101	4,1008
ŞABANÖZÜ	ÇAPARKAYI	219	-0,7315	0,9879	0,7472	1,0036	2,0895	0,4595	4,5948
ŞABANÖZÜ	KARAHANCI	221	-1,2118	-1,5352	-1,5286	-4,2756	0,5644	0,1784	1,7840
ŞABANÖZÜ	GÜNDOĞMUŞ	222	-1,1028	2,2493	0,1688	1,3153	2,1795	0,4715	4,7153
ŞABANÖZÜ	ÖDEK	223	-0,7005	5,0530	-1,0424	3,3101	2,7558	0,5416	5,4161
ŞABANÖZÜ	KARAMUSA	226	-0,8981	-2,4470	-1,5360	-4,8811	0,3895	0,1305	1,3052
ŞABANÖZÜ	BULGURCU	227	0,1408	4,3915	-1,2198	3,3125	2,7565	0,5417	5,4169
ŞABANÖZÜ	GÖLDAĞI	228	1,1011	-0,1848	3,4708	4,3872	3,0670	0,5752	5,7522
ŞABANÖZÜ	ÖZBEK	229	-0,2960	-0,3833	-0,8369	-1,5162	1,3616	0,3474	3,4741
ŞABANÖZÜ	KUTLUŞAR	231	-1,3369	-2,4591	-0,2746	-4,0706	0,6237	0,1935	1,9349
ŞABANÖZÜ	GÜMERDİĞİN	232	-1,3301	0,3230	-1,2730	-2,2801	1,1409	0,3068	3,0682
ŞABANÖZÜ	BÜYÜKYAKALI	233	-1,2304	-0,6646	-1,1794	-3,0743	0,9115	0,2601	2,6015
ŞABANÖZÜ	KÜÇÜKYAKALI	234	-1,3241	-1,1727	-0,3745	-2,8713	0,9701	0,2726	2,7256
ŞABANÖZÜ	KARAÖREN	235	-0,7306	5,7302	2,1249	7,1246	3,8578	0,6505	6,5050
ŞABANÖZÜ	ÇERÇİ	236	-0,7049	-0,0256	-0,0535	-0,7840	1,5731	0,3831	3,8306
MERKEZ	BOSTANLI	237	-1,1150	-1,6139	1,4190	-1,3100	1,4212	0,3578	3,5775
MERKEZ	KAHYALI	238	-0,7705	3,1827	-1,5386	0,8736	2,0520	0,4544	4,5435
MERKEZ	SARAYCIK	239	-0,2688	-1,4406	1,7549	0,0456	1,8128	0,4202	4,2020
MERKEZ	TIMARLI	241	-1,2056	-1,4832	-0,2002	-2,8890	0,9650	0,2715	2,7149
MERKEZ	KIZILIRMAK	242	-0,9512	0,1773	-0,8996	-1,6735	1,3161	0,3394	3,3936
MERKEZ	HALLAÇLI	243	-0,0169	2,6125	-1,9964	0,5993	1,9727	0,4433	4,4333
MERKEZ	YENİYAPAN	246	-1,1753	-2,7053	0,8825	-2,9981	0,9335	0,2649	2,6485
MERKEZ	AŞAĞIALAGÖZ	247	-1,3517	-1,7623	-0,8578	-3,9718	0,6522	0,2006	2,0057
MERKEZ	YUKARIALAGÖZ	249	-1,1524	0,8900	-1,2504	-1,5127	1,3626	0,3476	3,4759
MERKEZ	BOZKIR	250	-1,2121	-1,3857	-2,6075	-5,2053	0,2959	0,1025	1,0253
MERKEZ	ÇAYIRPINAR	252	-1,1830	-0,6662	0,5205	-1,3287	1,4158	0,3568	3,5683
MERKEZ	KARADAYI	254	-1,2888	-0,6064	-1,2489	-3,1441	0,8913	0,2558	2,5580
MERKEZ	GERMENCE	255	-1,2451	-1,3956	-1,1286	-3,7693	0,7107	0,2147	2,1475
MERKEZ	AŞAĞIPELİTÖZÜ	257	-1,0053	1,3440	-0,7095	-0,3708	1,6925	0,4020	4,0196
MERKEZ	KONAK	258	-1,2158	-1,4258	-1,1748	-3,8164	0,6971	0,2115	2,1149
MERKEZ	YUKARIPELİTÖZÜ	259	-1,0888	-0,7700	0,5636	-1,2952	1,4254	0,3585	3,5848
ELDİVAN	KÜÇÜKHACIBEY	260	-0,7530	-0,6754	-0,8684	-2,2969	1,1361	0,3059	3,0588
ELDİVAN	ELMACI	261	-0,9974	1,1568	-1,6905	-1,5310	1,3573	0,3467	3,4666
MERKEZ	AKÖREN	263	-1,0339	-0,7545	-1,7877	-3,5761	0,7665	0,2279	2,2785
MERKEZ	İNANDIK	265	-0,9806	-0,8922	-0,6129	-2,4857	1,0815	0,2952	2,9521
ŞABANÖZÜ	KARAKOÇAŞ	274	0,5218	4,4143	1,9146	6,8507	3,7786	0,6435	6,4353

Table C.1. (Continued)									
TOWNSHIP	**VILLAGE**	**ID**	**Econ**	**Service**	**Social**	**Total**	**NTotal**	**LogT**	**NLogT**
ILGAZ	MÜLAYİMYENİCE	278	-0,7583	-1,2516	-0,7020	-2,7119	1,0162	0,2821	2,8207
ILGAZ	ALIÇ	280	0,5879	1,1904	4,0861	5,8644	3,4937	0,6175	6,1745
ILGAZ	SEKİ	282	-0,6582	3,4506	0,5317	3,3241	2,7599	0,5421	5,4207
ILGAZ	SERÇELER	283	10,5231	-0,2856	2,3637	12,6013	5,4399	0,7706	7,7055
ILGAZ	BELSÖĞÜT	284	-0,7072	-1,8206	-1,1201	-3,6479	0,7458	0,2230	2,2303
ILGAZ	ÖDEMİŞ	285	3,4221	1,2018	3,3310	7,9548	4,0976	0,6710	6,7097
ILGAZ	GÖKÇEYAZI	286	2,8859	1,6268	0,1301	4,6427	3,1408	0,5828	5,8283
ILGAZ	AKÇAÖREN	287	3,3265	-2,5910	0,4223	1,1578	2,1340	0,4655	4,6548
ILGAZ	ALİBEY	289	-0,8488	0,8903	-0,2691	-0,2277	1,7338	0,4083	4,0831
ILGAZ	KIRIŞLAR	290	5,6015	9,5135	1,2123	16,3273	6,5163	0,8366	8,3662
ILGAZ	ESKİCE	292	-0,1423	-2,6111	1,6113	-1,1421	1,4697	0,3660	3,6599
ILGAZ	SÜLEYMANHACILAR	293	2,5465	2,9450	0,8552	6,3467	3,6331	0,6304	6,3040
ILGAZ	YENİDEMİRCİLER	294	-0,8318	-1,3814	-2,1335	-4,3467	0,5439	0,1730	1,7304
ILGAZ	ALPAGUT	295	-0,2404	-1,2270	1,5850	0,1176	1,8336	0,4233	4,2328
ILGAZ	ÖMERLİ	296	0,4939	-0,9693	-0,9120	-1,3874	1,3988	0,3539	3,5390
ILGAZ	ÇALTIPINAR	297	-0,4974	-0,2926	1,7007	0,9106	2,0627	0,4558	4,5582
ILGAZ	YUKARIBOZAN	298	1,0256	2,8201	0,4050	4,2507	3,0275	0,5711	5,7110
ILGAZ	AŞAĞIBOZAN	299	19,2338	3,9526	5,2001	28,3866	10,0000	1,0000	10,0000
ILGAZ	AŞAĞIMEYDAN	300	1,7163	-0,7345	0,7907	1,7725	2,3116	0,4886	4,8862
ILGAZ	YUKARIMEYDAN	301	0,5813	-1,3799	0,6119	-0,1867	1,7457	0,4101	4,1012
ILGAZ	EKSİK	302	-0,0841	-1,0144	0,0575	-1,0410	1,4989	0,3709	3,7088
ILGAZ	KAZANCI	303	-0,0624	-0,3865	-1,1810	-1,6299	1,3287	0,3416	3,4161
ILGAZ	YUVADEMİRCİLER	304	0,3712	-1,9901	0,4495	-1,1695	1,4617	0,3647	3,6466
ILGAZ	KURMALAR	305	-1,3015	0,3802	1,3926	0,4712	1,9357	0,4381	4,3809
ILGAZ	ONAÇ	306	-0,0428	-1,0606	0,3620	-0,7414	1,5854	0,3850	3,8505
ILGAZ	MUSAKÖY	308	1,5524	2,1756	4,6859	8,4140	4,2302	0,6819	6,8189
ILGAZ	AŞAĞIDERE	309	-0,2850	-2,6141	7,1594	4,2603	3,0303	0,5714	5,7139
ILGAZ	KALEKÖY	310	0,7786	7,7720	1,6534	10,2041	4,7474	0,7220	7,2203
ILGAZ	YUKARIDERE	311	2,7258	-2,3954	3,9826	4,3130	3,0456	0,5730	5,7299
ILGAZ	YAZI	312	-0,5923	-2,6401	0,2198	-3,0126	0,9293	0,2640	2,6396
ILGAZ	CENDERE	313	-0,9047	-1,5366	-0,2307	-2,6719	1,0277	0,2844	2,8442
ILGAZ	HACIHASAN	315	2,4032	5,9897	4,1946	12,5875	5,4359	0,7703	7,7029
ILGAZ	BOZATLI	316	-0,0007	0,3917	0,5361	0,9272	2,0674	0,4565	4,5647
ILGAZ	SATILAR	318	1,3725	-2,6170	0,2832	-0,9613	1,5219	0,3747	3,7469
ILGAZ	BÜKCÜK	320	2,3209	0,5607	0,2997	3,1813	2,7186	0,5374	5,3741
ILGAZ	SAZAK	321	2,2836	0,1139	0,0656	2,4631	2,5111	0,5132	5,1322
ILGAZ	İNKÖYÜ	322	0,6689	-0,5448	0,8048	0,9289	2,0679	0,4565	4,5654
ILGAZ	SARMAŞIK	324	-0,2601	2,4430	0,4479	2,6308	2,5596	0,5190	5,1899
ILGAZ	SAĞIRLAR	325	-0,5167	-1,8745	-0,0338	-2,4250	1,0990	0,2987	2,9867
ILGAZ	BAŞDİBEK	327	-0,9550	4,9977	6,2429	10,2856	4,7709	0,7238	7,2377
ILGAZ	AKTAŞ	328	-0,6420	-0,3380	0,7854	-0,1946	1,7434	0,4098	4,0977
ILGAZ	ŞEYHYUNUS	329	-0,9760	-1,6249	0,3255	-2,2754	1,1423	0,3071	3,0707
MERKEZ	DİKENLİ	330	-0,9995	0,1187	-1,9075	-2,7882	0,9941	0,2775	2,7754
ILGAZ	MESUTÖREN	331	-0,5071	-1,7336	0,9225	-1,3183	1,4187	0,3573	3,5734
ILGAZ	KUŞÇAYIRI	332	1,7605	8,7809	0,4318	10,9732	4,9696	0,7382	7,3819
ILGAZ	KIZILSIN	334	6,1398	2,3721	3,2229	11,7348	5,1896	0,7536	7,5363

Table C.1. (Continued)									
TOWNSHIP	**VILLAGE**	**ID**	**Econ**	**Service**	**Social**	**Total**	**NTotal**	**LogT**	**NLogT**
ILGAZ	ERİCEK	336	2,3167	-0,7432	1,9513	3,5247	2,8178	0,5485	5,4852
MERKEZ	KESECİK	337	-0,1286	-0,0572	-0,2040	-0,3898	1,6870	0,4011	4,0111
MERKEZ	KARATEPE	338	-0,3677	-1,1758	5,0023	3,4588	2,7988	0,5464	5,4641
ILGAZ	BELÖREN	339	3,1173	1,0589	-2,5679	1,6083	2,2642	0,4826	4,8256
MERKEZ	HIDIRLIK	340	-1,1088	-2,0417	-1,5876	-4,7382	0,4308	0,1423	1,4231
MERKEZ	İÇYENİCE	341	1,1229	3,3151	-0,1389	4,2991	3,0415	0,5726	5,7257
ELDİVAN	YUKARIYANLAR	342	-0,5029	-1,9728	0,3848	-2,0909	1,1956	0,3172	3,1723
ELDİVAN	GÖLEZ	344	5,4877	1,0031	0,1211	6,6120	3,7097	0,6374	6,3736
ELDİVAN	OĞLAKLI	346	0,5250	-0,4571	-0,0240	0,0439	1,8123	0,4201	4,2013
MERKEZ	AŞAĞIYANLAR	347	-0,0905	0,0396	-0,5241	-0,5750	1,6335	0,3927	3,9272
ELDİVAN	ÇİFTLİK	348	-0,3978	-0,5860	-1,1470	-2,1308	1,1840	0,3151	3,1505
MERKEZ	SÜLEYMANLI	349	-1,0923	-1,1427	-1,7157	-3,9507	0,6583	0,2021	2,0207
MERKEZ	DOĞANTEPE	350	-0,5255	1,1440	3,0805	3,6991	2,8682	0,5540	5,5405
MERKEZ	DEREÇATI	351	0,4308	2,0810	-0,7762	1,7357	2,3010	0,4873	4,8727
MERKEZ	PAŞA	352	-0,5984	-1,4761	-1,8838	-3,9584	0,6561	0,2015	2,0153
MERKEZ	DEĞİM	353	1,6424	1,7190	-1,8034	1,5579	2,2497	0,4807	4,8068
MERKEZ	BAŞEĞMEZ	355	-1,1078	-2,6167	-2,5050	-6,2295	0,0000	0,0000	0,0000
MERKEZ	İNAÇ	356	-1,0368	-0,0116	-2,1664	-3,2148	0,8709	0,2513	2,5135
MERKEZ	TUZLU	357	0,0011	-0,7288	-2,7981	-3,5258	0,7811	0,2312	2,3120
MERKEZ	DUTAĞAÇ	358	-1,1108	-1,3977	-1,4834	-3,9918	0,6464	0,1991	1,9915
MERKEZ	AYAN	360	-1,1906	-1,7075	-0,1159	-3,0140	0,9289	0,2639	2,6387
MERKEZ	BUGAY	362	-0,0343	-0,0253	-2,6708	-2,7304	1,0108	0,2810	2,8097
MERKEZ	İKİÇAM	364	-1,2414	-0,9373	-0,2655	-2,4442	1,0935	0,2976	2,9758
MERKEZ	AHLATKÖY	365	-0,9348	-1,2881	-2,6139	-4,8368	0,4023	0,1342	1,3420
MERKEZ	AŞAĞIÇAVUŞ	366	0,4189	-1,5802	0,3440	-0,8174	1,5635	0,3815	3,8150
MERKEZ	GÜMÜŞDÜVEN	367	-0,7320	-0,5103	0,1826	-1,0598	1,4934	0,3700	3,6998
MERKEZ	AKÇAVAKIF	368	-1,0200	-0,4186	-2,4182	-3,8569	0,6854	0,2087	2,0867
MERKEZ	KÜÇÜKLÜ	372	-0,9114	-1,3343	-1,1573	-3,4029	0,8165	0,2393	2,3927
MERKEZ	AĞZIBÜYÜK	374	0,5881	1,5074	-1,2736	0,8219	2,0370	0,4523	4,5230
MERKEZ	KUZUKÖY	375	-1,0005	-2,7053	-0,9465	-4,6523	0,4556	0,1492	1,4924
MERKEZ	ALTINLI	376	1,0008	-2,6123	-1,4617	-3,0733	0,9118	0,2602	2,6021
MERKEZ	ÇIRÇIR	378	-0,8751	-2,2178	-2,1176	-5,2104	0,2944	0,1021	1,0207
MERKEZ	ALAÇAT	379	-0,4736	-0,9408	-2,5545	-3,9689	0,6531	0,2008	2,0078
MERKEZ	KAPUT	380	-0,5980	0,2439	-1,2512	-1,6053	1,3359	0,3429	3,4287
OVACIK	SOFUOĞLU	385	0,5929	-0,9630	-2,2570	-2,6272	1,0407	0,2870	2,8704
YAPRAKLI	BALIBIDIK	390	-1,1446	-2,0752	-2,1167	-5,3364	0,2580	0,0907	0,9068
MERKEZ	BAYINDIR	391	-1,2944	-1,7638	-1,9915	-5,0497	0,3408	0,1162	1,1619
MERKEZ	ÇİVİKÖY	392	0,1068	0,3200	-1,7216	-1,2949	1,4255	0,3585	3,5850
MERKEZ	HASAKÇA	393	-1,0498	1,1200	1,4699	1,5402	2,2445	0,4800	4,8002
ILGAZ	ILISILIK	413	-1,3192	-1,9356	0,1647	-3,0901	0,9069	0,2592	2,5917
YAPRAKLI	YUKARIÖZ	423	-1,0322	2,3861	0,1420	1,4959	2,2317	0,4784	4,7836
YAPRAKLI	AYVA	433	-0,4539	1,2796	0,6022	1,4278	2,2121	0,4758	4,7580
ILGAZ	BEYKÖY	434	-1,1504	-1,1540	1,2869	-1,0175	1,5057	0,3720	3,7201
ILGAZ	ŞARAYCIK	435	0,0343	3,0106	1,5264	4,5714	3,1202	0,5807	5,8072
ILGAZ	ARPAYERİ	436	-0,6576	-0,9978	0,4441	-1,2114	1,4497	0,3626	3,6261
ILGAZ	ÇELTİKBAŞI	437	-0,6048	-1,3693	0,4057	-1,5684	1,3465	0,3448	3,4476

Table C.1. (Continued)									
TOWNSHIP	**VILLAGE**	**ID**	**Econ**	**Service**	**Social**	**Total**	**NTotal**	**LogT**	**NLogT**
ILGAZ	YERKUYU	438	-0,7429	-1,0363	0,2600	-1,5192	1,3607	0,3473	3,4726
ILGAZ	YUVASARAY	439	-0,9072	0,0197	-1,4345	-2,3220	1,1288	0,3045	3,0448
MERKEZ	DANABAŞI	440	-0,9447	0,3954	-0,1969	-0,7462	1,5840	0,3848	3,8482
MERKEZ	KARADİBEK	442	11,9827	2,3251	-0,3225	13,9853	5,8397	0,7963	7,9628
MERKEZ	BÜYÜKBAHÇELİ	443	-1,0720	-0,9327	0,4669	-1,5378	1,3553	0,3463	3,4632
MERKEZ	BAYANPINAR	444	-0,5516	-1,2298	-1,6297	-3,4110	0,8142	0,2387	2,3874
MERKEZ	KAPAKLI	445	-0,5113	-0,9063	0,3013	-1,1164	1,4771	0,3672	3,6724
MERKEZ	KARAÖMER	446	0,9476	-0,6196	-0,2320	0,0960	1,8273	0,4224	4,2236
MERKEZ	SAKARCA	447	-0,8802	-0,4989	-0,6061	-1,9853	1,2261	0,3229	3,2294
MERKEZ	KARAMÜRSEL	450	1,1064	-0,3299	2,0557	2,8322	2,6178	0,5258	5,2582
MERKEZ	KAVLAKLI	452	-0,9428	-0,3462	0,7116	-0,5774	1,6328	0,3926	3,9261
MERKEZ	KUZEYKIŞLA	454	0,9484	-0,7791	-0,4255	-0,2562	1,7256	0,4071	4,0705
KURŞUNLU	HÜYÜK	460	-0,6665	1,6193	1,1255	2,0783	2,4000	0,4997	4,9969
ORTA	DEREBAYINDIR	464	0,3471	0,9767	0,1415	1,4653	2,2229	0,4772	4,7721
ORTA	İNCECİK	465	-0,5952	-1,1751	-1,5200	-3,2904	0,8491	0,2465	2,4654
ILGAZ	KUYUPINAR	467	1,3719	0,6120	1,7394	3,7233	2,8752	0,5548	5,5481
ILGAZ	GAZİLER	468	-0,7915	1,5494	0,9034	1,6613	2,2795	0,4845	4,8452
ILGAZ	KESE	469	1,8612	-0,0927	5,1082	6,8766	3,7861	0,6442	6,4419
ILGAZ	ÇATAK	470	-0,8811	-0,7099	0,4530	-1,1380	1,4708	0,3662	3,6619
ORTA	GÖKÇEÖREN	471	-0,7021	-0,9503	-0,5702	-2,2227	1,1575	0,3100	3,1000
ILGAZ	YAYLACIK	475	10,3202	-0,5362	-0,5208	9,2631	4,4756	0,7014	7,0140
ILGAZ	DANİŞMENT	477	5,4377	1,1881	1,9359	8,5617	4,2729	0,6854	6,8535
ILGAZ	YAYLAÖREN	479	-0,8835	-0,4943	0,2466	-1,1312	1,4728	0,3665	3,6652
ILGAZ	OKÇULAR	480	3,3807	-0,4625	-0,0126	2,9056	2,6390	0,5283	5,2828
MERKEZ	KORÇULLU	481	-0,9952	-0,9890	-0,6614	-2,6456	1,0353	0,2860	2,8596
MERKEZ	TEPEALAGÖZ	486	-0,5727	-0,7094	-1,0187	-2,3007	1,1349	0,3057	3,0566
MERKEZ	HACILAR	488	-1,0946	-0,4836	-0,7748	-2,3530	1,1199	0,3027	3,0273
ELDİVAN	SARITARLA	489	1,1601	-1,4380	-1,7355	-2,0134	1,2179	0,3214	3,2142
MERKEZ	KARATEKİN	490	0,3615	-0,9269	0,4301	-0,1354	1,7605	0,4124	4,1237
KURŞUNLU	HOCAHASAN	491	-1,0433	-0,5431	-1,0766	-2,6630	1,0303	0,2849	2,8494
MERKEZ	ALANPINAR	492	-0,6299	-0,6529	-0,8210	-2,1037	1,1919	0,3165	3,1653
MERKEZ	YUKARIÇAVUŞ	493	-1,1192	-1,7877	-1,9831	-4,8901	0,3869	0,1298	1,2976
ELDİVAN	GÖLEZKAYI	495	0,7772	0,0589	-0,1237	0,7123	2,0054	0,4479	4,4791
MERKEZ	ALICA	497	0,3368	0,1219	-0,3518	0,1070	1,8305	0,4228	4,2283
MERKEZ	KARALLI	498	-0,9315	-0,2651	0,3065	-0,8901	1,5425	0,3781	3,7807
MERKEZ	CACIKLAR	499	-0,8025	-0,5986	-0,7295	-2,1306	1,1841	0,3151	3,1507
MERKEZ	GÜNEYKIŞLA	502	-0,3757	-0,0167	0,7806	0,3883	1,9118	0,4347	4,3466
ELDİVAN	SARAY	505	-1,0851	-2,5044	1,9818	-1,6077	1,3351	0,3427	3,4274
ŞABANÖZÜ	BAKIRLI	507	-0,4355	-1,7183	-2,3740	-4,5278	0,4916	0,1591	1,5909
ORTA	SAKARCAÖREN	508	-0,3350	-0,6526	-0,8542	-1,8418	1,2675	0,3306	3,3057
ŞABANÖZÜ	MARTKÖY	509	-1,3275	-1,1482	-1,1121	-3,5878	0,7631	0,2271	2,2707
ORTA	HÜYÜK	510	-0,9070	-1,0434	0,9877	-0,9627	1,5215	0,3746	3,7463
MERKEZ	KEMALLI	516	-1,3092	-1,0633	-0,0850	-2,4575	1,0897	0,2968	2,9682
KURŞUNLU	DEMİRCİÖREN	526	0,4439	1,2652	-0,0942	1,6150	2,2661	0,4828	4,8280
KURŞUNLU	DAĞÖREN	527	0,3292	1,3886	-0,1347	1,5831	2,2569	0,4816	4,8162
MERKEZ	ORTAKAYA	528	-1,0947	1,1341	5,0414	5,0808	3,2673	0,5956	5,9556

Table C.1. (Continued)									
TOWNSHIP	**VILLAGE**	**ID**	**Econ**	**Service**	**Social**	**Total**	**NTotal**	**LogT**	**NLogT**
MERKEZ	ÇATALELMA	530	-1,2265	0,1174	0,7074	-0,4016	1,6836	0,4006	4,0057
ELDİVAN	BÜYÜKHACIBEY	532	-1,0814	-0,0216	0,1295	-0,9735	1,5184	0,3741	3,7411
ORTA	KISAÇ	538	-0,7092	0,5540	1,5924	1,4372	2,2148	0,4761	4,7615
KURŞUNLU	MADENLİ	541	-0,9971	-0,9559	-1,1089	-3,0619	0,9151	0,2609	2,6092
KURŞUNLU	ÇAVUNDUR	545	-1,0477	-1,1061	-1,5786	-3,7325	0,7213	0,2173	2,1728
ORTA	BUĞDÜZ	548	-1,0114	-0,6140	-1,1663	-2,7917	0,9931	0,2773	2,7733
ORTA	YUVA	549	-0,7435	0,2334	0,9563	0,4462	1,9285	0,4371	4,3706
ORTA	KARGA	550	-0,6183	3,1567	0,6464	3,1848	2,7196	0,5375	5,3752
ORTA	ORTABAYINDIR	551	-0,3005	1,8666	-1,1690	0,3972	1,9143	0,4350	4,3503
ORTA	TUTMAÇBAYINDIR	552	-0,5935	-0,1482	-0,7130	-1,4547	1,3794	0,3505	3,5052
ORTA	KAYIÖREN	553	-0,9699	-0,7919	-1,1638	-2,9255	0,9545	0,2693	2,6928
KURŞUNLU	OLUKLU	565	0,1904	1,1868	1,1663	2,5436	2,5344	0,5160	5,1600
KURŞUNLU	TOPÇU	568	0,4084	1,5125	0,1062	2,0272	2,3852	0,4979	4,9785
KURŞUNLU	İNCEKAYA	570	-0,6823	-0,6900	-0,0715	-1,4438	1,3825	0,3511	3,5107
OVACIK	YAYLACILAR	571	-0,8266	0,4094	-0,9116	-1,3288	1,4157	0,3568	3,5682
OVACIK	ERKEÇ	573	-0,2101	-1,1197	-0,9465	-2,2763	1,1420	0,3070	3,0703
OVACIK	AVLAĞIKAYA	574	-1,0380	-0,4553	-0,3079	-1,8012	1,2793	0,3327	3,3271
OVACIK	KIŞLAKÖY	575	-0,8435	0,7270	2,1461	2,0296	2,3859	0,4979	4,9794
OVACIK	TAŞOĞLU	576	-0,8583	-0,8534	-0,2087	-1,9204	1,2448	0,3264	3,2640
OVACIK	GÜMELİK	577	-1,0927	0,1050	0,9091	-0,0785	1,7769	0,4148	4,1484
OVACIK	SARILAR	578	-0,4348	-0,7484	-0,7723	-1,9555	1,2347	0,3245	3,2453
OVACIK	AHMETLER	579	-1,0687	-0,3777	0,4382	-1,0082	1,5083	0,3725	3,7245
OVACIK	ABDULLAR	581	-0,7201	-0,1411	-0,2282	-1,0894	1,4849	0,3685	3,6855
OVACIK	KAVAKLAR	582	0,9171	2,5023	0,2373	3,6566	2,8559	0,5527	5,5271
OVACIK	GANİBEYLER	583	-0,5607	-0,1430	-0,9220	-1,6257	1,3300	0,3418	3,4182
OVACIK	BOYALI	585	-0,9982	-0,9057	0,4266	-1,4773	1,3728	0,3494	3,4938
OVACIK	SÜLÜK	586	-1,0719	-1,5490	-2,5867	-5,2075	0,2952	0,1023	1,0233
OVACIK	DUDAŞ	587	-1,0922	-0,7315	0,5950	-1,2286	1,4447	0,3618	3,6177
OVACIK	BOYALI	588	-0,8137	-0,2719	0,9352	-0,1504	1,7561	0,4117	4,1171
OVACIK	BODUROĞLU	591	-0,5145	0,0484	0,2385	-0,2276	1,7338	0,4083	4,0832
OVACIK	DÖKECEK	592	0,1158	-2,5600	-0,9784	-3,4226	0,8109	0,2380	2,3799
OVACIK	ŞAMLAR	594	-0,8958	-0,7758	-0,7164	-2,3880	1,1097	0,3008	3,0076
OVACIK	ALINCA	595	-0,5911	-2,0990	-0,2462	-2,9362	0,9514	0,2686	2,6863
OVACIK	EKİNCİK	596	-0,9241	-0,5539	-0,0049	-1,4829	1,3712	0,3491	3,4910
OVACIK	KOLTUK	598	-0,2233	-2,2299	1,5970	-0,8561	1,5523	0,3797	3,7968
OVACIK	YIĞINOT	599	-0,2107	1,0064	-0,2963	0,4994	1,9438	0,4392	4,3925
OVACIK	DOĞANLAR	600	3,0081	0,0792	-0,9442	2,1430	2,4187	0,5020	5,0199
OVACIK	BÖLÜKÖREN	601	0,6424	0,1420	-0,6586	0,1259	1,8360	0,4236	4,2363
OVACIK	İMANLAR	602	-1,0112	-0,8170	-1,0786	-2,9068	0,9599	0,2704	2,7042
OVACIK	PELİTÇİK	603	2,0694	-0,4765	0,2653	1,8582	2,3364	0,4917	4,9175
OVACIK	HATİPOĞLU	604	-0,3406	-2,2784	-1,1621	-3,7810	0,7073	0,2139	2,1394
OVACIK	YAKA	605	3,0066	0,3608	-0,0972	3,2701	2,7443	0,5403	5,4031
OVACIK	GÖKÇEDÜZ	606	1,2077	-2,4874	1,2083	-0,0713	1,7790	0,4152	4,1516
OVACIK	GÜNEYSAZ	607	-0,0467	-2,3566	-0,0712	-2,4746	1,0847	0,2958	2,9584
OVACIK	BEYDİNİ	609	5,2454	-0,4130	-0,8891	3,9433	2,9387	0,5617	5,6168
OVACIK	KÜÇÜKSU	611	4,7972	-1,0158	-1,2390	2,5424	2,5340	0,5160	5,1596

Table C.1. (Continued)									
TOWNSHIP	VILLAGE	ID	Econ	Service	Social	Total	NTotal	LogT	NLogT
OVACIK	ÇUKUR	613	0,6160	-0,1791	0,2228	0,6597	1,9902	0,4458	4,4578
OVACIK	YENİÖREN	614	3,9423	0,9285	0,0145	4,8853	3,2109	0,5899	5,8993
OVACIK	PÜRÇÜKÖREN	615	-0,2451	0,1780	1,6149	1,5477	2,2467	0,4803	4,8030
KURŞUNLU	SARIALAN	618	-0,2872	-0,7182	-0,4080	-1,4134	1,3913	0,3526	3,5260
MERKEZ	DEDEKÖY	624	-1,1191	-0,2987	-1,3283	-2,7462	1,0063	0,2800	2,8004
MERKEZ	BALIBAĞI	626	-0,5568	-0,8703	-1,9593	-3,3864	0,8213	0,2403	2,4035
MERKEZ	OVACIK	627	-0,8168	-0,2751	-0,5287	-1,6206	1,3314	0,3421	3,4208
MERKEZ	ÜNÜR	629	-1,3208	-1,4370	-0,2359	-2,9937	0,9348	0,2651	2,6512
MERKEZ	TÜNEY	632	0,3388	0,9835	1,8059	3,1283	2,7033	0,5357	5,3567
ELDİVAN	HİSARCIK	633	-0,2624	-0,3286	-1,1874	-1,7784	1,2858	0,3339	3,3390
ORTA	ÖZLÜ	634	-1,0220	0,4598	0,8764	0,3142	1,8904	0,4316	4,3158
ORTA	ELMALI	637	-1,0710	-0,1934	-0,2454	-1,5098	1,3634	0,3477	3,4774
ORTA	KAYILAR	638	-1,1758	-0,8714	-0,9617	-3,0089	0,9304	0,2642	2,6419
KURŞUNLU	KIZILİBRİK	641	4,8482	-0,6453	-0,3833	3,8196	2,9030	0,5578	5,5783
KURŞUNLU	AĞILÖZÜ	102	-1,2583	-1,8509	-2,5190	-5,6283	0,1737	0,0631	0,6307
KURŞUNLU	KIZILCA	103	-0,9353	0,9499	0,4938	0,5084	1,9465	0,4396	4,3962
KURŞUNLU	GÖLLÜCE	104	-1,2395	-0,3979	-0,8446	-2,4820	1,0826	0,2954	2,9542
MERKEZ	DEMİRÇEVRE	106	-1,2433	-1,2358	-0,6330	-3,1122	0,9005	0,2578	2,5780

APPENDIX D

PRINCIPLE COMPONENTS ANALYSIS (PCA) OUTPUTS

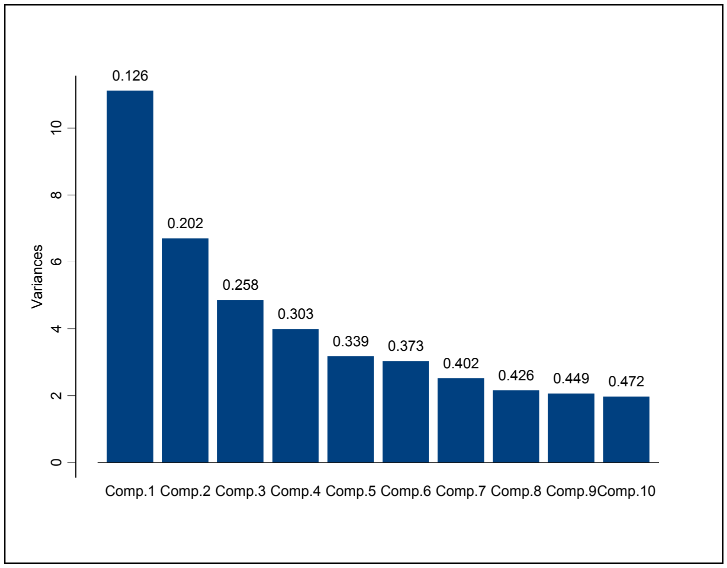

Figure D.1. Relative importance of principal components for economy dimension, before the number of the variables is reduced.

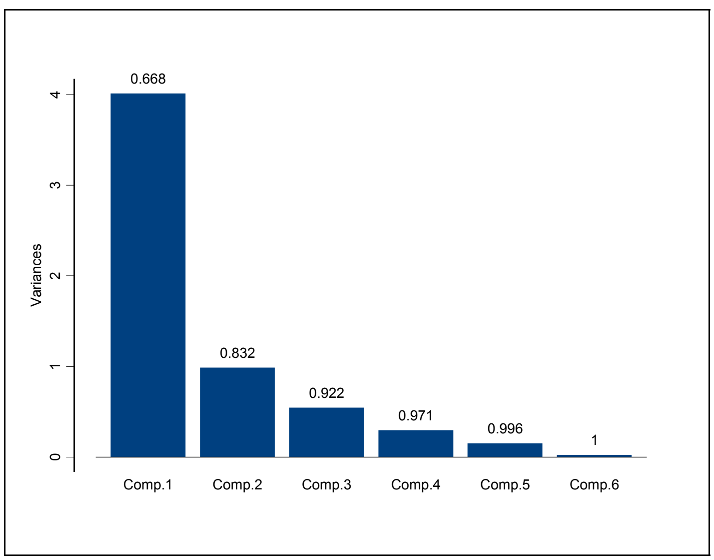

Figure D.2. Relative importance of principal components for economy dimension, after the number of the variables is reduced to 6.

Table D.1. Component loadings of the variables for economy dimension, after the number of the variables is reduced to 6.

Loadings:

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Comp.6
BULL	0.457		-0.250	-0.357	0.774	
RADIO	0.410	0.413		-0.633	-0.506	
SSHEEP	0.424	-0.506	0.118	0.124	-0.142	-0.717
SHEEP	0.420	-0.517	0.116		-0.240	0.692
GOAT	0.349	0.441	0.712	0.363	0.210	
MULE	0.379	0.332	-0.635	0.565	-0.153	

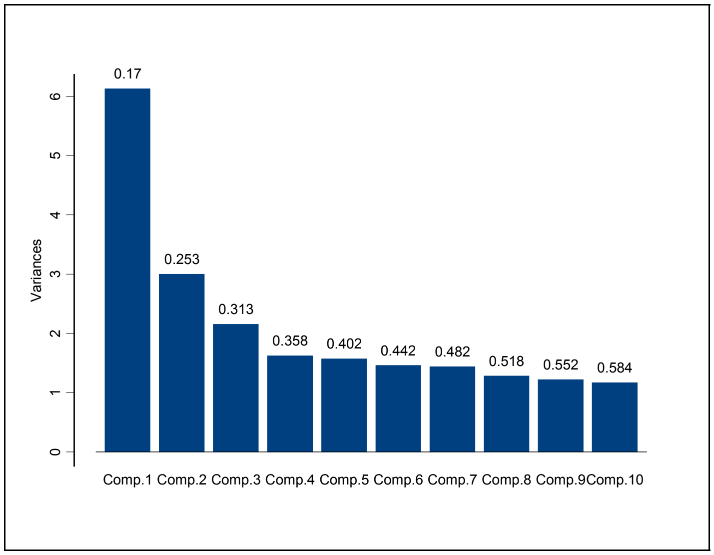

Figure D.3. Relative importance of principal components for service dimension, before the number of the variables is reduced.

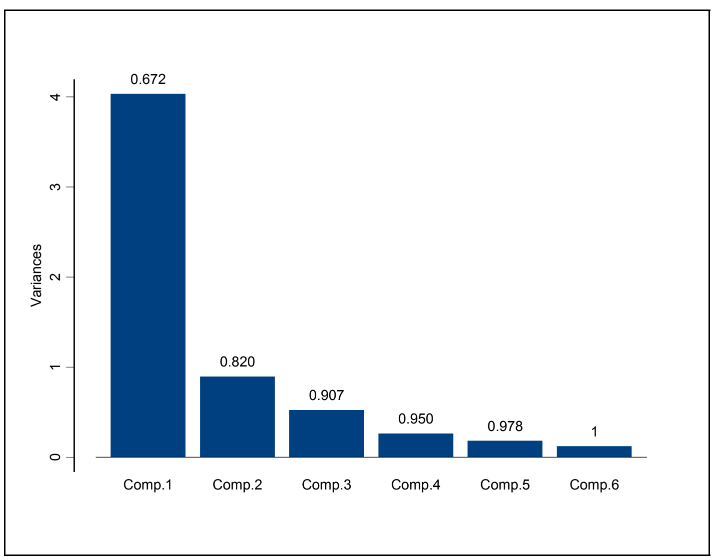

Figure D.4. Relative importance of principal components for service dimension, after the number of the variables is reduced to 6.

Table D.2. Component loadings of the variables for service dimension, after the number of the variables is reduced to 6.

Loadings:

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Comp.6
PCLASS	0.438	-0.201	0.202	0.717	0.455	
PTEACHER	0.452	0.174	0.151	0.250	-0.824	
PSCHOOL	0.353	-0.559	0.527	-0.533		
FNWORK	0.337	-0.490	-0.792			
PGIRL	0.433	0.425		-0.209	0.235	-0.730
PBOY	0.423	0.444	-0.177	-0.305	0.226	0.670

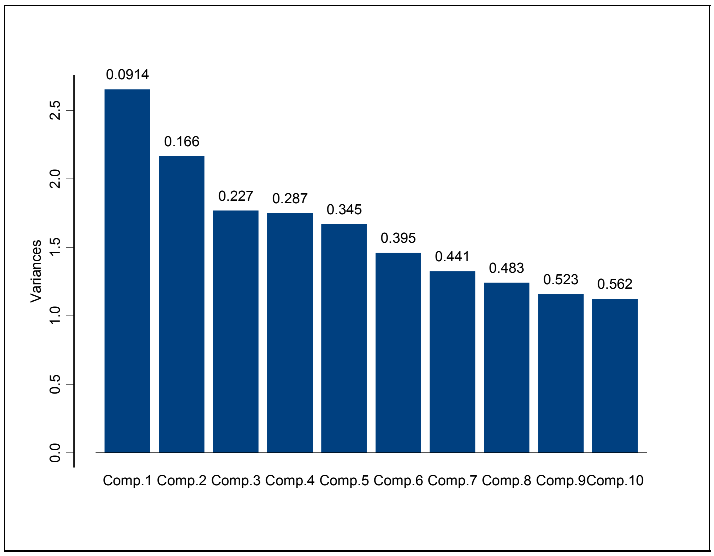

Figure D.5. Relative importance of principal components for social dimension, before the number of the variables is reduced.

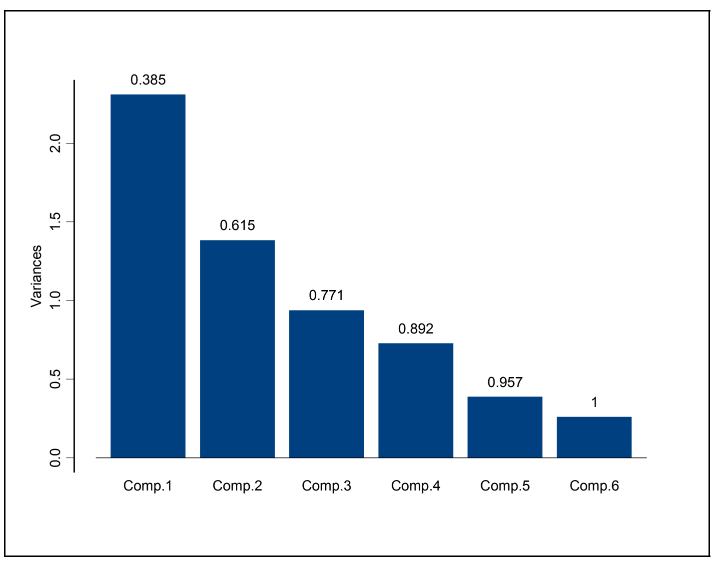

Figure D.6. Relative importance of principal components for service dimension, after the number of the variables is reduced to 6.

Table D.3. Component loadings of the variables for social dimension, after the number of the variables is reduced to 6.

Loadings:

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Comp.6
H1F	0.549	0.239		0.316	-0.243	-0.689
H3R	0.561			0.229	0.743	0.282
POP	0.383		0.448	-0.806		
HADOBE	0.370	-0.590		0.252	-0.533	0.403
HSCHOOL	0.256	-0.169	-0.869	-0.366		-0.126
HWOOD	0.188	0.752	-0.172		-0.318	0.517

APPENDIX E

Table E.1. The distance matrix used for spatial moving averages. A sample is shown.

Village ID	1	2	3	4	5	6	7	8
1	0	72593	502248	563583	404830	461344	435686	369261
2	72593	0	573084	632404	475652	531951	505542	440282
3	502248	573084	0	84012	97440	41654	72519	133030
4	563583	632404	84012	0	166256	112401	129949	201365
5	404830	475652	97440	166256	0	56744	39054	35888
6	461344	531951	41654	112401	56744	0	32693	92621
7	435686	505542	72519	129949	39054	32693	0	72014
8	369261	440282	133030	201365	35888	92621	72014	0
9	178780	249236	323848	385207	226416	282753	256918	191107
10	749571	817986	435326	483244	473111	455358	483025	486405
11	522485	589116	337743	413949	326576	336286	352431	324310
12	830283	894422	572342	624670	600316	588827	614526	609126
13	850950	916921	560097	606440	596534	580042	607448	608426

APPENDIX F

GWR RESULTS

For original index:

```
**********************************************
*       Geographically Weighted Regression      *
*               Release 3.0.1                   *
*            Dated: 06-vii-2003                 *
*                                               *
*       Martin Charlton, Chris Brunsdon         *
*            Stewart Fotheringham                *
*     (c) University of Newcastle upon Tyne     *
**********************************************
Program starts at: Sun Jun 13 22:12:39 2004

**************************************************************
*                                                            *
*        GEOGRAPHICALLY WEIGHTED GAUSSIAN REGRESSION         *
*                                                            *
**************************************************************
 Number of data cases read: 331
 Observation points read...

 Dependent mean=  1.79959226
 Number of observations, nobs= 331
 Number of predictors,   nvar= 4
 Observation Easting extent:   0.0229769107
 Observation Northing extent:  0.0151176928
 ** NB these are in radians
*Finding bandwidth...
  ... using all regression points
 This can take some time...
 *Calibration will be based on  331 cases
*Adaptive kernel sample size limits:      16    331
 *AICc minimisation begins...
           Bandwidth                    AICc
        113.340353425000       1034.280548354626
        173.500000000000       1030.916141120097
        233.659646575000       1028.045042813862
        270.840352984737       1026.779007708261
        293.819293318165       1026.227185207661
        308.021059498406       1025.977019135786
        316.798233715827       1025.978337331219
        302.596467535587       1026.092961483571
** Convergence after     8 function calls
** Convergence: Local Sample Size=    308

*********************************************************
*           GLOBAL REGRESSION PARAMETERS                *
*********************************************************
```

```
Diagnostic information...
Residual sum of squares.........         411.742845
Effective number of parameters..           5.000000
Sigma...........................           1.123839
Akaike Information Criterion....        1023.847453
Coefficient of Determination....           0.057479
Adjusted r-square...............           0.042979

Parameter       Estimate         Std Err              T
---------     ------------     ------------       ------------
Intercept     0.007478960326   0.422320860971      0.017709190026
 SLOPEMEA     0.025743874420   0.007670318825      3.356297731400
 ASPECTME     0.031611022533   0.045499185416      0.694760203362
 DEM_MEAN     0.000486114250   0.000236798303      2.052862167358
 FIRSTQSO     1.075603277967   0.393926939189      2.730463981628


**********************************************************
*                GWR ESTIMATION                          *
**********************************************************
 Fitting Geographically Weighted Regression Model...
 Number of observations............ 331
 Number of independent variables... 5
  (Intercept is variable 1)
 Number of nearest neighbours...... 308
 Number of locations to fit model.. 331

Diagnostic information...
Residual sum of squares.........         400.321216
Effective number of parameters..           9.352493
Sigma...........................           1.115615
Akaike Information Criterion....        1023.716930
Coefficient of Determination....           0.083624
Adjusted r-square...............           0.056896

**********************************************************
*                      ANOVA                             *
**********************************************************
Source              SS        DF        MS        F
OLS Residuals       411.7     5.00
GWR Improvement     11.4      4.35      2.6242
GWR Residuals       400.3    321.65     1.2446    2.1084

**********************************************************
*          PARAMETER 5-NUMBER SUMMARIES                  *
**********************************************************
Label    Minimum  Lwr Quartile  Median   Upr Quartile  Maximum

Intrcept  -0.698260  -0.442613  -0.010577   0.175302   1.082796
SLOPEMEA   0.007355   0.024502   0.027746   0.031759   0.035506
ASPECTME  -0.028829   0.005023   0.012589   0.019266   0.043705
DEM_MEAN   0.000283   0.000420   0.000513   0.000641   0.000839
FIRSTQSO   0.203809   0.858228   1.310659   1.566267   1.868611
```

```
 <------------ LOWER --------->< ------------ UPPER -------------->
   Label Far Out   Outer Fence Outside   Inner Fence   Inner Fence
Outside   Outer Fence Far Out
-------- ------- ------------- ------- ------------- -------------
------- ------------- -------
Intrcept       0     -2.296358       0     -1.369486      1.102175
0      2.029047       0
SLOPEMEA       0      0.002733      18      0.013618      0.042643
0      0.053528       0
ASPECTME       0     -0.037705      17     -0.016341      0.040630
2      0.061994       0
DEM_MEAN       0     -0.000241       0      0.000090      0.000971
0      0.001302       0
FIRSTQSO       0     -1.265890       0     -0.203831      2.628326
0      3.690385       0

*************************************************
*                                               *
*   Test for spatial variability of parameters  *
*                                               *
*************************************************

Tests based on the Monte Carlo significance test
procedure due to Hope [1968,JRSB,30(3),582-598]

Parameter                  P-value
----------      ------------------
Intercept            0.15000   n/s
SLOPEMEA             0.30000   n/s
ASPECTME             0.86000   n/s
DEM_MEAN             0.48000   n/s
FIRSTQSO             0.12000   n/s

*** = significant at .1% level
**  = significant at 1% level
*   = significant at 5% level

Program terminates normally at: Sun Jun 13 22:13:02 2004
```

For logarithmically transformed index:

```
*********************************************
*       Geographically Weighted Regression      *
*               Release 3.0.1                   *
*            Dated: 06-vii-2003                 *
*                                               *
*       Martin Charlton, Chris Brunsdon         *
*            Stewart Fotheringham               *
*     (c) University of Newcastle upon Tyne     *
*********************************************
Program starts at: Sun Jun 13 22:14:51 2004

 Dependent mean=  3.9205687
 Number of observations, nobs= 331
 Number of predictors,   nvar= 4
 Observation Easting extent:   0.0229769107
 Observation Northing extent:  0.0151176928
 ** NB these are in radians
*Finding bandwidth...
  ... using all regression points
 This can take some time...
 *Calibration will be based on  331 cases
*Adaptive kernel sample size limits:      16    331
 *AICc minimisation begins...
           Bandwidth                     AICc
        113.340353425000       1180.498884148221
        173.500000000000       1179.715811369127
        233.659646575000       1179.317620609227
        270.840352984737       1178.462460356497
        293.819293318165       1178.101037827261
        308.021059498406       1177.931653254631
        316.798233715827       1177.939527102225
        302.596467535587       1178.042093742507
** Convergence after     8 function calls
** Convergence: Local Sample Size=    308

**************************************************
*           GLOBAL REGRESSION PARAMETERS             *
**************************************************
Diagnostic information...
Residual sum of squares.........         652.805346
Effective number of parameters..           5.000000
Sigma...........................           1.415087
Akaike Information Criterion....        1176.398733
Coefficient of Determination....           0.063738
Adjusted r-square...............           0.049334
```

Parameter	Estimate	Std Err	T
Intercept	1.651909905125	0.531766969623	3.106454610825
SLOPEMEA	0.032919320830	0.009658112053	3.408463239670
ASPECTME	-0.000474363655	0.057290477893	-0.008279973641
DEM_MEAN	0.000780478480	0.000298165512	2.617601394653
FIRSTQSO	1.351704883897	0.496014651570	2.725131034851

```
*********************************************************
*                GWR ESTIMATION                         *
*********************************************************
 Fitting Geographically Weighted Regression Model...
 Number of observations............ 331
 Number of independent variables... 5
  (Intercept is variable 1)
 Number of nearest neighbours...... 308
 Number of locations to fit model.. 331

Diagnostic information...
Residual sum of squares.........          636.334605
Effective number of parameters..            9.352493
Sigma...........................            1.406542
Akaike Information Criterion....         1177.121286
Coefficient of Determination....            0.087360
Adjusted r-square...............            0.060741


*********************************************************
*                      ANOVA                            *
*********************************************************
        Source                     SS         DF              MS
F
OLS Residuals                   652.8       5.00
GWR Improvement                  16.5       4.35          3.7842
GWR Residuals                   636.3     321.65          1.9784
1.9128


*********************************************************
*          PARAMETER 5-NUMBER SUMMARIES                 *
*********************************************************
```

Label	Minimum	Lwr Quartile	Median	Upr Quartile	Maximum
Intrcept	0.499383	0.971357	1.595356	1.890553	2.893650
SLOPEMEA	0.008141	0.029181	0.033044	0.039629	0.044196
ASPECTME	-0.074313	-0.028336	-0.017150	-0.006125	0.006742
DEM_MEAN	0.000510	0.000701	0.000958	0.001096	0.001401
FIRSTQSO	0.272946	1.187594	1.609369	1.975336	2.398624

	LOWER				UPPER			
Label	Far Out	Outer Fence	Outside	Inner Fence	Inner Fence	Outside	Outer Fence	Far Out
Intrcept	0	-1.786234	0	-0.407439	3.269349	0	4.648144	0
SLOPEMEA	0	-0.002164	8	0.013508	0.055301	0	0.070974	0
ASPECTME	0	-0.094969	11	-0.061653	0.027192	0	0.060508	0
DEM_MEAN	0	-0.000486	0	0.000107	0.001689	0	0.002283	0
FIRSTQSO	0	-1.175633	0	0.005981	3.156949	0	4.338563	0

```
*************************************************
*                                               *
*   Test for spatial variability of parameters  *
*                                               *
*************************************************
```

Tests based on the Monte Carlo significance test procedure due to Hope [1968,JRSB,30(3),582-598]

Parameter	P-value	
Intercept	0.02000	*
SLOPEMEA	0.20000	n/s
ASPECTME	0.88000	n/s
DEM_MEAN	0.18000	n/s
FIRSTQSO	0.04000	*

*** = significant at .1% level
** = significant at 1% level
* = significant at 5% level

Program terminates normally at: Sun Jun 13 22:15:15 2004

Table F.1. Residuals and t values for each independent variable in GWR are shown.

ID	TVAL_1	TVAL_2	TVAL_3	TVAL_4	TVAL_5	RESID	STDRES
3	-0,879	3,390	0,549	1,688	3,528	-0,438	-0,305
4	-0,872	3,283	0,681	1,540	3,319	-0,474	-0,333
5	0,087	3,032	0,274	1,505	3,253	-0,701	-0,485
6	0,171	2,954	0,282	1,408	3,195	-0,017	-0,011
7	-0,098	3,177	0,279	1,603	3,456	-0,102	-0,070
8	0,014	3,091	0,278	1,540	3,341	1,382	0,950
9	-0,031	3,124	0,284	1,545	3,406	-0,017	-0,012
11	-0,178	3,234	0,280	1,648	3,530	-0,705	-0,496
12	-0,614	3,435	0,325	1,754	3,800	-0,305	-0,212
13	0,843	2,068	0,087	1,216	1,879	0,066	0,046
526	-0,020	2,929	0,132	1,926	2,790	0,469	0,322
552	1,308	1,258	-0,087	0,819	1,010	-0,429	-0,299
553	1,255	1,436	-0,033	0,868	1,199	-0,743	-0,520
36	0,316	2,815	0,246	1,395	2,940	1,106	0,764
46	0,443	2,682	0,235	1,302	2,776	-1,002	-0,691
47	0,412	2,715	0,235	1,337	2,804	0,521	0,361
66	1,030	1,622	-0,031	1,073	1,363	-0,551	-0,391
67	0,997	1,819	0,038	1,097	1,596	-0,989	-0,683
68	0,991	1,314	-0,232	1,124	1,034	0,981	0,680
510	0,802	1,644	-0,129	1,239	1,362	-0,107	-0,074
70	0,298	2,577	0,102	1,698	2,374	-0,084	-0,058
71	0,492	2,275	0,047	1,546	2,016	0,542	0,375
72	0,808	2,082	0,080	1,257	1,880	0,208	0,143
532	0,611	2,289	-0,108	1,683	1,528	-0,206	-0,142
76	0,720	2,115	0,063	1,346	1,889	0,978	0,676
78	0,787	1,572	-0,223	1,314	1,258	0,131	0,090
79	0,769	1,557	-0,327	1,502	1,217	-0,533	-0,366
470	-0,616	3,463	0,289	1,816	3,805	-0,728	-0,505
83	-0,001	2,715	-0,157	2,145	2,068	-0,187	-0,128
84	-0,101	2,714	-0,192	2,181	2,136	0,235	0,161
87	-0,839	3,433	-0,051	2,483	3,047	1,436	0,982
86	-0,379	3,076	-0,093	2,342	2,431	0,107	0,073
89	0,481	2,066	-0,070	1,503	1,772	-0,044	-0,031
90	0,301	2,331	-0,014	1,674	2,033	0,336	0,235
91	-0,068	2,754	0,020	1,937	2,505	-0,827	-0,571
93	0,264	2,175	-0,259	1,828	1,761	0,547	0,378
94	-0,388	2,965	-0,119	2,184	2,592	-0,312	-0,215
96	-0,311	3,054	0,065	2,126	2,858	-0,994	-0,685
97	0,169	2,516	0,019	1,781	2,241	-0,489	-0,339
98	-0,689	3,281	-0,084	2,402	2,888	-0,387	-0,266
99	-0,490	3,358	0,145	2,167	3,356	0,125	0,086
100	-0,596	3,453	0,155	2,185	3,504	-0,081	-0,056
101	-0,933	3,629	0,095	2,256	3,714	-0,803	-0,556

Table F.1. (Continued)							
ID	TVAL_1	TVAL_2	TVAL_3	TVAL_4	TVAL_5	RESID	STDRES
104	-1,007	3,631	0,019	2,374	3,562	-0,536	-0,369
106	-0,844	3,454	-0,022	2,433	3,193	-0,997	-0,683
107	-0,716	3,494	0,117	2,271	3,502	-0,216	-0,148
527	-0,123	3,042	0,142	1,983	2,942	0,474	0,325
109	-0,735	3,555	0,173	2,107	3,739	-0,594	-0,410
110	-0,812	3,588	0,161	2,117	3,780	-0,588	-0,408
111	-0,693	3,531	0,220	1,984	3,793	-0,933	-0,643
112	-0,688	3,520	0,247	1,933	3,808	-0,211	-0,147
113	-0,793	3,572	0,207	2,019	3,824	0,019	0,013
114	-0,872	3,602	0,190	2,046	3,840	1,760	1,205
115	-0,967	3,645	0,139	2,116	3,838	-0,012	-0,008
116	-0,846	3,600	0,166	2,092	3,814	-0,262	-0,181
117	-0,989	3,658	0,098	2,200	3,791	0,108	0,074
118	-0,264	3,296	0,262	1,745	3,564	-0,196	-0,136
119	-0,253	3,287	0,273	1,707	3,578	-0,914	-0,632
120	-0,600	3,486	0,186	2,087	3,638	-0,319	-0,219
121	-0,445	3,395	0,201	2,027	3,520	-1,022	-0,703
618	-0,429	3,398	0,247	1,851	3,668	-0,795	-0,551
123	-0,419	3,393	0,225	1,929	3,592	-0,732	-0,505
126	-0,301	3,322	0,247	1,817	3,548	-1,847	-1,281
131	0,351	2,739	0,198	1,498	2,738	0,966	0,670
133	0,134	2,781	0,126	1,810	2,627	0,481	0,332
134	0,212	2,816	0,172	1,697	2,739	-0,424	-0,293
138	-0,445	3,219	0,090	2,208	3,077	0,262	0,180
142	-0,090	3,108	0,191	1,894	3,099	-1,126	-0,776
143	-0,433	3,364	0,181	2,087	3,420	-0,264	-0,183
147	-0,256	3,178	0,156	2,068	3,109	2,225	1,523
148	-0,312	3,251	0,168	2,061	3,242	-0,145	-0,099
150	0,065	2,976	0,189	1,779	2,950	-0,202	-0,140
151	-0,172	3,234	0,265	1,695	3,484	-0,496	-0,341
152	-0,191	3,247	0,246	1,775	3,436	-1,002	-0,691
153	-0,141	3,193	0,222	1,829	3,294	-0,453	-0,313
154	-0,052	3,145	0,272	1,604	3,388	0,060	0,041
155	-0,042	3,115	0,223	1,750	3,216	-1,180	-0,813
157	-0,034	3,122	0,238	1,712	3,249	0,009	0,006
158	0,018	3,088	0,251	1,639	3,240	0,040	0,028
159	-0,003	3,102	0,246	1,670	3,243	-1,313	-0,902
162	-0,181	3,241	0,257	1,728	3,466	0,767	0,532
163	-0,115	3,194	0,260	1,688	3,408	-0,668	-0,466
164	-0,102	3,181	0,248	1,726	3,350	1,145	0,786
165	-0,035	3,130	0,251	1,673	3,294	-1,009	-0,703
166	0,008	3,098	0,267	1,586	3,309	1,467	1,014
167	-0,022	3,122	0,257	1,642	3,305	-1,450	-1,012
541	-0,239	3,266	0,220	1,893	3,379	-0,706	-0,486
169	-0,262	3,291	0,232	1,861	3,452	-0,978	-0,678

Table F.1. (Continued)							
ID	TVAL_1	TVAL_2	TVAL_3	TVAL_4	TVAL_5	RESID	STDRES
179	0,182	2,941	0,248	1,500	3,089	-0,359	-0,249
180	0,116	2,999	0,245	1,567	3,139	-0,226	-0,156
183	0,158	2,961	0,244	1,534	3,097	-1,277	-0,893
184	0,290	2,809	0,208	1,535	2,828	-0,572	-0,394
185	-0,028	3,095	0,215	1,775	3,158	0,234	0,162
187	0,052	3,026	0,214	1,728	3,065	1,535	1,065
188	0,123	2,983	0,230	1,616	3,070	-0,400	-0,276
191	0,198	2,922	0,237	1,535	3,020	-0,358	-0,245
192	0,057	3,055	0,251	1,608	3,205	-0,805	-0,555
193	0,012	3,117	0,635	1,275	1,893	-0,846	-0,583
195	-0,052	3,157	0,650	1,313	1,957	-0,066	-0,046
199	-0,136	3,204	0,671	1,358	2,040	-1,114	-0,766
201	-0,198	3,222	0,732	1,335	2,077	6,239	4,366
212	0,526	2,042	-0,274	1,830	1,539	-0,008	-0,005
505	0,281	2,497	-0,164	1,976	1,824	-0,514	-0,356
219	0,588	1,865	-0,313	1,749	1,437	0,309	0,214
549	0,874	1,898	0,028	1,214	1,655	-0,003	-0,002
221	1,461	0,785	-0,388	1,218	0,540	-0,854	-0,596
222	1,373	0,914	-0,386	1,287	0,644	0,759	0,527
223	1,274	1,010	-0,393	1,335	0,737	1,283	0,887
342	-0,134	3,037	-0,001	2,146	2,230	-0,620	-0,425
545	-0,022	3,054	0,193	1,847	3,037	-1,121	-0,773
226	1,558	0,604	-0,404	1,121	0,402	-1,078	-0,747
227	1,438	0,696	-0,417	1,128	0,492	1,172	0,816
228	1,452	0,707	-0,413	1,153	0,498	1,378	0,976
229	1,541	0,585	-0,414	1,092	0,394	-0,192	-0,134
231	1,525	0,559	-0,415	1,023	0,373	-0,939	-0,655
232	1,396	0,719	-0,385	1,009	0,499	-0,454	-0,312
233	1,186	1,039	-0,295	1,059	0,767	-0,737	-0,506
234	1,254	0,947	-0,307	1,019	0,685	-0,740	-0,508
235	1,065	1,178	-0,322	1,192	0,892	2,309	1,608
236	1,102	1,147	-0,280	1,093	0,870	-0,033	-0,023
237	0,488	2,672	0,222	1,361	1,558	0,181	0,125
238	0,504	2,657	0,229	1,332	1,533	0,702	0,487
239	0,423	2,769	0,326	1,280	1,578	0,500	0,346
493	-0,684	3,508	0,299	2,215	2,726	-0,966	-0,667
241	0,385	2,810	0,341	1,301	1,618	-0,134	-0,093
242	0,339	2,863	0,392	1,281	1,646	0,234	0,163
243	0,471	2,711	0,299	1,266	1,533	0,672	0,467
627	0,061	3,108	0,440	1,502	1,953	-0,306	-0,210
495	0,189	2,815	0,012	1,890	1,935	0,232	0,159
246	0,204	2,989	0,414	1,389	1,797	-0,199	-0,140
247	0,329	2,870	0,364	1,330	1,674	-0,586	-0,405
249	0,289	2,907	0,356	1,385	1,729	0,042	0,029
250	0,234	2,958	0,355	1,446	1,797	-1,109	-0,766

Table F.1. (Continued)							
ID	TVAL_1	TVAL_2	TVAL_3	TVAL_4	TVAL_5	RESID	STDRES
615	0,282	2,846	0,283	1,310	3,080	0,917	0,644
254	0,395	2,772	0,230	1,450	1,668	-0,615	-0,423
255	0,399	2,728	0,144	1,540	1,688	-0,879	-0,608
257	0,271	2,855	0,159	1,646	1,826	0,218	0,150
258	0,561	2,499	0,050	1,520	1,544	-0,949	-0,654
259	0,314	2,755	0,063	1,727	1,806	0,084	0,058
260	0,492	2,458	-0,068	1,737	1,647	-0,631	-0,435
261	0,384	2,613	-0,021	1,772	1,750	-0,322	-0,220
263	0,541	2,490	0,012	1,591	1,580	-0,789	-0,541
265	0,594	2,396	-0,029	1,600	1,534	-0,466	-0,320
491	-0,677	3,420	0,084	2,292	3,353	-0,897	-0,614
274	0,985	1,463	-0,340	1,545	1,075	2,366	1,645
278	-0,854	3,337	0,597	1,611	3,465	-1,374	-0,960
280	-0,732	3,506	0,285	1,858	3,828	0,841	0,585
475	-0,959	3,410	0,524	1,705	3,491	2,164	1,491
282	-0,821	3,499	0,318	1,811	3,812	0,462	0,321
283	-0,864	3,487	0,365	1,793	3,755	3,120	2,178
284	-1,000	3,547	0,320	1,874	3,737	-1,279	-0,878
285	-0,963	3,564	0,285	1,904	3,795	1,766	1,217
286	-0,778	3,540	0,253	1,920	3,838	0,760	0,523
287	-0,839	3,550	0,263	1,912	3,840	-0,187	-0,128
479	-1,025	3,651	0,161	2,077	3,841	-0,191	-0,132
289	-0,916	3,573	0,248	1,926	3,842	-0,701	-0,483
290	-0,837	3,571	0,225	1,968	3,848	4,300	2,946
292	-0,937	3,616	0,191	2,031	3,852	-0,480	-0,328
293	-0,972	3,611	0,209	1,992	3,847	1,707	1,172
294	-1,029	3,639	0,176	2,024	3,847	-1,045	-0,725
295	-1,012	3,606	0,241	1,975	3,808	0,006	0,004
296	-1,069	3,641	0,207	2,041	3,797	-0,115	-0,080
297	-1,045	3,585	0,289	1,942	3,740	0,391	0,270
298	-0,911	3,502	0,359	1,811	3,743	0,491	0,340
299	-0,946	3,511	0,359	1,824	3,725	7,236	5,028
300	-0,992	3,486	0,425	1,806	3,610	-0,416	-0,292
301	-0,944	3,474	0,436	1,792	3,635	-0,421	-0,291
302	-0,882	3,431	0,488	1,739	3,608	-1,128	-0,790
303	-0,936	3,400	0,535	1,693	3,497	-1,300	-0,908
304	-0,924	3,350	0,589	1,620	3,414	-1,265	-0,881
305	-0,983	3,395	0,575	1,696	3,395	-0,524	-0,362
306	-0,983	3,422	0,512	1,718	3,484	-0,895	-0,622
316	-0,963	3,461	0,469	1,783	3,580	-0,594	-0,413
308	-1,004	3,448	0,490	1,761	3,503	1,986	1,368
309	-0,940	3,491	0,394	1,804	3,688	0,867	0,596
310	-1,025	3,480	0,451	1,805	3,543	2,523	1,755
311	-0,953	3,486	0,413	1,804	3,657	0,758	0,521
312	-1,049	3,522	0,396	1,863	3,598	-1,382	-0,979

Table F.1. (Continued)							
ID	TVAL_1	TVAL_2	TVAL_3	TVAL_4	TVAL_5	RESID	STDRES
315	-1,093	3,505	0,455	1,862	3,445	3,430	2,355
318	-0,979	3,406	0,550	1,707	3,437	-0,728	-0,501
471	1,234	1,268	-0,108	0,882	1,011	-0,578	-0,399
320	-1,056	3,493	0,445	1,828	3,515	0,747	0,518
321	-1,042	3,445	0,537	1,775	3,390	-0,097	-0,067
322	-1,128	3,564	0,376	1,952	3,518	0,468	0,325
324	-1,125	3,531	0,470	1,936	3,324	0,951	0,663
325	-1,116	3,664	0,180	2,066	3,781	-0,233	-0,163
327	-1,119	3,640	0,236	2,043	3,724	3,252	2,264
328	-1,169	3,676	0,208	2,144	3,672	-0,328	-0,225
329	-1,156	3,703	0,133	2,183	3,745	-0,700	-0,484
330	-1,137	3,713	0,042	2,362	3,641	-0,695	-0,478
331	-1,201	3,693	0,212	2,261	3,538	-0,807	-0,553
332	-1,159	3,591	0,387	2,047	3,391	3,280	2,261
467	-1,162	3,629	0,293	2,070	3,582	1,098	0,761
334	-1,186	3,651	0,305	2,191	3,409	3,184	2,193
477	-0,857	3,498	0,340	1,805	3,784	1,714	1,188
336	-1,190	3,706	0,165	2,253	3,637	0,473	0,328
337	-1,189	3,718	0,129	2,335	3,605	-0,260	-0,178
338	-1,191	3,703	0,176	2,381	3,422	0,397	0,274
339	-1,091	3,691	0,115	2,183	3,798	0,310	0,213
340	-0,276	3,219	0,110	2,163	2,371	-1,414	-0,969
341	-0,541	3,390	0,140	2,315	2,617	1,242	0,853
507	0,721	1,850	-0,287	1,719	1,363	-1,151	-0,788
344	0,276	2,718	-0,012	1,849	1,854	1,893	1,307
502	0,268	2,932	0,480	1,234	1,680	0,438	0,302
346	0,072	2,931	0,039	1,955	2,044	0,271	0,186
347	-0,083	3,067	0,074	2,059	2,197	-0,057	-0,039
348	-0,196	2,988	-0,078	2,232	2,265	-0,291	-0,202
349	0,114	2,993	0,174	1,790	1,996	-0,850	-0,585
350	-0,053	3,123	0,189	1,911	2,156	1,189	0,817
351	-1,006	3,596	0,430	2,163	3,035	0,109	0,075
352	-0,821	3,559	0,357	2,199	2,842	-0,986	-0,675
353	-0,605	3,476	0,417	2,020	2,620	0,809	0,558
355	-0,974	3,610	0,322	2,281	3,007	-1,550	-1,074
356	-0,401	3,386	0,369	1,960	2,446	-0,745	-0,512
357	-0,295	3,321	0,312	1,958	2,364	-0,662	-0,455
358	-0,651	3,497	0,353	2,127	2,681	-0,853	-0,587
486	0,271	2,930	0,412	1,326	1,719	-0,217	-0,150
360	-0,698	3,494	0,195	2,345	2,760	-0,744	-0,510
488	0,410	2,778	0,302	1,330	1,610	0,033	0,023
362	-0,987	3,577	-0,012	2,495	3,296	-0,868	-0,594
538	0,773	2,083	0,068	1,297	1,866	0,370	0,257
364	-1,125	3,672	0,137	2,451	3,232	-1,113	-0,771
365	-1,134	3,663	0,273	2,329	3,242	-1,237	-0,857

Table F.1. (Continued)							
ID	TVAL_1	TVAL_2	TVAL_3	TVAL_4	TVAL_5	RESID	STDRES
368	-0,917	3,587	0,165	2,450	2,978	-1,043	-0,718
530	0,514	2,602	0,132	1,444	1,561	0,039	0,027
372	-0,177	3,266	0,467	1,664	2,190	-1,054	-0,734
374	-0,008	3,141	0,592	1,352	1,942	0,481	0,330
375	0,055	3,110	0,503	1,416	1,923	-1,324	-0,924
376	-0,013	3,153	0,548	1,416	1,973	-0,807	-0,555
624	0,251	2,930	0,300	1,500	1,802	-0,496	-0,344
378	0,046	3,111	0,537	1,375	1,911	-1,343	-0,926
379	-0,079	3,198	0,544	1,478	2,047	-1,027	-0,704
380	-0,130	3,234	0,517	1,557	2,116	-0,251	-0,172
385	-0,375	3,319	0,709	1,499	2,280	-0,953	-0,653
390	-0,568	3,456	0,477	1,921	2,567	-1,292	-0,889
391	-0,245	3,301	0,512	1,656	2,238	-1,520	-1,047
392	-0,244	3,305	0,396	1,815	2,289	-0,199	-0,138
393	-0,376	3,372	0,478	1,797	2,383	0,546	0,377
413	-1,086	3,558	0,497	2,022	3,142	-1,360	-0,947
423	-0,883	3,448	0,714	1,752	2,813	0,226	0,157
433	-0,433	3,317	0,779	1,455	2,309	0,293	0,201
434	-0,956	3,360	0,609	1,643	3,362	-0,979	-0,675
435	-0,940	3,314	0,680	1,584	3,264	0,270	0,189
436	-1,008	3,384	0,614	1,684	3,297	-1,265	-0,883
437	-1,043	3,419	0,645	1,752	3,175	-1,266	-0,887
438	-1,080	3,467	0,566	1,828	3,246	-0,972	-0,675
439	-1,037	3,478	0,629	1,853	3,066	-1,043	-0,723
440	0,048	3,103	0,578	1,318	1,885	-0,035	-0,024
442	0,202	2,993	0,459	1,334	1,776	4,434	3,058
443	0,236	2,961	0,437	1,325	1,745	-0,087	-0,060
444	0,137	3,047	0,492	1,356	1,835	-0,623	-0,431
445	0,130	3,048	0,528	1,309	1,820	0,086	0,059
446	0,111	3,057	0,564	1,277	1,819	0,464	0,320
447	0,249	2,950	0,470	1,268	1,711	-0,144	-0,099
481	0,369	2,833	0,406	1,227	1,598	-0,303	-0,209
469	-0,998	3,518	0,364	1,836	3,683	1,457	1,009
450	0,200	2,991	0,508	1,268	1,748	1,283	0,885
626	-0,012	3,151	0,356	1,670	2,066	-0,955	-0,656
452	0,309	2,893	0,427	1,261	1,660	0,171	0,119
480	-0,805	3,514	0,299	1,848	3,825	0,304	0,210
454	0,313	2,889	0,449	1,223	1,640	0,367	0,253
548	0,925	1,791	0,002	1,174	1,533	-0,927	-0,658
468	-1,107	3,606	0,297	1,998	3,669	0,452	0,312
499	0,198	2,987	0,545	1,214	1,724	-0,189	-0,130
460	0,202	2,903	0,220	1,593	2,942	0,679	0,467
629	-0,121	3,208	0,625	1,407	2,050	-0,924	-0,634
528	-0,278	2,813	-0,188	2,183	2,349	1,511	1,038
464	1,127	1,565	-0,021	0,986	1,321	0,448	0,309

Table F.1. (Continued)							
ID	TVAL_1	TVAL_2	TVAL_3	TVAL_4	TVAL_5	RESID	STDRES
492	-0,959	3,611	0,245	2,370	3,005	-0,452	-0,310
489	-0,357	3,182	0,006	2,297	2,434	-0,235	-0,162
490	-0,607	3,318	-0,013	2,438	2,664	0,174	0,119
516	0,411	2,785	0,352	1,255	1,577	-0,161	-0,112
509	0,840	1,800	-0,262	1,639	1,272	-1,040	-0,715
550	1,201	1,491	-0,027	0,917	1,252	0,954	0,663
551	1,201	1,428	-0,053	0,918	1,179	0,093	0,065
565	0,132	2,991	0,258	1,524	3,156	0,664	0,458
568	0,141	2,985	0,268	1,486	3,177	0,417	0,290
571	0,154	2,972	0,276	1,445	3,191	-0,473	-0,328
570	0,080	3,039	0,264	1,548	3,225	-0,409	-0,280
573	0,252	2,876	0,254	1,419	3,038	-0,614	-0,423
574	0,194	2,936	0,272	1,426	3,138	-0,441	-0,303
576	0,293	2,837	0,253	1,388	2,990	-0,677	-0,466
577	0,237	2,890	0,284	1,346	3,131	0,024	0,017
578	0,206	2,917	0,289	1,354	3,178	-0,237	-0,165
579	0,232	2,898	0,279	1,370	3,120	-0,346	-0,236
582	0,270	2,861	0,277	1,341	3,074	1,258	0,865
581	0,258	2,869	0,285	1,321	3,113	-0,086	-0,060
583	0,298	2,833	0,277	1,314	3,047	-0,135	-0,093
592	0,372	2,759	0,245	1,347	2,875	-0,919	-0,630
585	0,384	2,740	0,267	1,248	2,941	-0,376	-0,262
586	0,376	2,754	0,255	1,299	2,913	-1,140	-0,787
587	0,419	2,710	0,248	1,285	2,840	-0,495	-0,341
588	0,400	2,731	0,247	1,311	2,856	-0,060	-0,041
575	0,233	2,898	0,265	1,411	3,081	0,621	0,428
591	0,392	2,739	0,244	1,329	2,854	-0,192	-0,132
594	0,373	2,753	0,265	1,266	2,946	-0,520	-0,358
595	0,360	2,767	0,260	1,293	2,948	-0,880	-0,607
596	0,272	2,861	0,273	1,353	3,061	-0,345	-0,236
598	0,273	2,859	0,263	1,376	3,040	-0,183	-0,125
599	0,230	2,902	0,274	1,388	3,108	0,157	0,108
600	0,300	2,831	0,263	1,348	3,015	0,590	0,407
601	0,341	2,791	0,252	1,349	2,935	0,001	0,001
602	0,340	2,790	0,258	1,325	2,960	-0,693	-0,477
603	0,370	2,761	0,251	1,325	2,901	0,642	0,440
604	0,313	2,817	0,257	1,353	2,986	-1,083	-0,751
605	0,310	2,820	0,253	1,371	2,973	1,104	0,759
606	0,369	2,761	0,253	1,317	2,910	0,138	0,095
607	0,377	2,750	0,261	1,274	2,932	-0,630	-0,434
609	0,404	2,723	0,257	1,263	2,890	0,948	0,661
611	0,318	2,812	0,274	1,303	3,019	0,682	0,474
613	0,331	2,798	0,275	1,285	3,010	0,222	0,155
614	0,268	2,862	0,280	1,331	3,087	1,741	1,206
632	0,732	2,118	-0,139	1,617	1,404	1,135	0,783

Table F.1. (Continued)							
ID	TVAL_1	TVAL_2	TVAL_3	TVAL_4	TVAL_5	RESID	STDRES
637	1,205	1,070	-0,218	0,892	0,830	-0,321	-0,222
638	1,312	0,990	-0,198	0,798	0,750	-0,784	-0,546
641	0,229	2,887	0,228	1,543	2,949	0,966	0,668
181	0,189	2,935	0,286	1,379	3,187	0,180	0,124

APPENDIX G

THE SCRIPTS WRITTEN FOR THE THESIS

Spatial Moving Averages Routine for MatLAB

```
n = input('Smoothing Factor : ');
n=n+1;
[Ascend,Index]=sort(WholeDistance);
   for i=2:332
      for j=1:n
        proximate(i-1,j)=Index(Index(j,i),1);
      end
   end
NewValue=zeros(331,1);
   for i=1:331
   for j=2:n
      NewValue(i)=NewValue(i)+SEindex(proximate(i,j),2);
   end
      NewValue(i)=(NewValue(i)+SEindex(i,2))/n;
end
```

Database transformation Routine for MatLAB

```
%sum by polygon2 values
j=0;
i=1;
[m,n] = size(raw);
while i<(m+1)
sum=raw(i,3);

   while (i<m)&(raw(i,1)==raw(i+1,1)) & (raw(i,2)==raw(i+1,2))
      sum=sum+raw(i+1,3);
      i=i+1;
   end
   j=j+1;
   rawout(j,1)=raw(i,1);
   rawout(j,2)=raw(i,2);
   rawout(j,3)=sum;
   i=i+1;
   end
j=1;
indexed(1,1)=1;
```

Database transformation Routine for MatLAB (Continued)

```
indexed(1,2)=rawout(1,1);
indexed(1,3)=rawout(1,2);
indexed(1,4)=rawout(1,3);
[m,n] = size(rawout);

for i=1:(m-1)
    if rawout(i,1)~=rawout(i+1,1)
      j=j+1;
   end

   indexed(i+1,1)=j;
   indexed(i+1,2)=rawout(i+1,1);
   indexed(i+1,3)=rawout(i+1,2);
   indexed(i+1,4)=rawout(i+1,3);
   end

   for i=1:m
      j=indexed(i,1);

      switch indexed(i,3)
      case 1
         final(j,2)=indexed(i,4);
      case 2
         final(j,3)=indexed(i,4);
      case 3
         final(j,4)=indexed(i,4);
      case 4
         final(j,5)=indexed(i,4);
      case 5
         final(j,6)=indexed(i,4);
      case 6
         final(j,7)=indexed(i,4);
      case 7
         final(j,8)=indexed(i,4);
      case 8
         final(j,9)=indexed(i,4);
      case 9
         final(j,10)=indexed(i,4);
      case 10
         final(j,11)=indexed(i,4);
         end
      final(j,1)=indexed(i,2);
   end
```

Geoformula of Aspect Map Classification for TNT Mips

```
if (Aspect_Value = -1)
{
Value = 10
}

else if (Aspect_Value > 120)
{
Value = (240 – Aspect_Value) / 12
}

else
{
value = Aspect_Value/12
}
```