

IMPORTANCE OF INTEGRATION OF PUBLIC PARTICIPATION INTO
ENVIRONMENTAL MANAGEMENT

by

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ABSTRACT

Technical approaches such as wastewater treatment technologies and other pollution prevention methods have generally been considered as the means of improving the environmental conditions in a basin. However, generation and prevention of environmental pollution in a water basin is principally based on socio-economic structures and environmental awareness of the basin population. This study was conducted to integrate a social approach based on basin population and environmental awareness with the classical environmental management approach.

The region of study Küçükçekmece, is a precious natural system with the Küçükçekmece Lagoon, its basin and a variety of endemic species. In addition, it is a cosmopolitan social system which is a representative of Turkey's population suffering heavy pollution due to mismanagement. The method of study was such that preliminary face-to-face interviews and open ended questionnaire were followed by development and evaluation of closed ended questionnaire.

Analysis of results showed that the basin generally consisted of people who have low level of education and income. According to these people, environment is mostly defined as 'people' such as friends and neighbors. The perception of environmental pollution and problems by five senses was found to be an important factor for the identification of these problems. Within environmental qualifications, 'environmental attitude' was the main indicator in the level of environmental awareness of local community in Küçükçekmece. It is followed by 'system knowledge' and 'indigenous knowledge'. Primary school graduation and middle age are the socio-economic characteristics of the people who have the highest score in system knowledge, indigenous knowledge and environmental attitude questions.

ÖZET

Bir havzadaki çevresel şartların iyileştirilmesinde genelde atıksu arıtım teknolojileri ve diğer kirlilik önleme yöntemleri gibi teknik yaklaşımlar kullanılmaktadır. Bununla birlikte, bir su havzasında kirliliğin ortaya çıkışı da önlenmesi de o havzada yaşayan insanların sosyo-ekonomik yapıları ve çevresel farkındalıkları ile yakından ilişkilidir. Bu çalışma, havza nüfusu ve çevresel farkındalığa dayanan sosyal bir yaklaşımı klasik çevre yönetim anlayışına entegre etmek amacıyla gerçekleştirilmiştir.

Çalışma alanı olan Küçükçekmece Havzası, içerdiği Küçükçekmece Lagünü ve havzası ve çok çeşitli endemik türleri ile değerli bir doğal sistem alanıdır. Ayrıca, Türkiye nüfusunu temsil edebilir özelliklerde kosmopolit yapıya sahip bir sosyal sistem de havza sınırları içinde yaşamını sürdürmektedir.

Çalışmada yöntem olarak ilk önce yüzyüze görüşme ve açık uçlu sorulara dayanan anket yöntemleri denenmiş; bunların ardından kapalı uçlu sorulara dayanan anket yöntemi geliştirilerek kullanılmış ve sonuçları değerlendirilmiştir.

Çalışmada yapılan analiz sonuçları göstermiştir ki, havzada yaşayanlar genelde düşük eğitim ve gelir seviyelerine sahip kişilerdir. Bu insanlar için çevre genelde arkadaş ve komşu anlamına gelmektedir. Çevre problemlerinin tanımlanmasında çevre kirliliğinin ve problemlerinin beş duyu ile algılanması önemli bir belirleyicidir. Küçükçekmece Havzası'nda yaşayan halkın çevresel farkındalık seviyesinin en önemli göstergesi sahip oldukları 'çevresel tutum'dur. Bunu 'sistem bilgisi' ve yerel çevresel bilgi' takip etmektedir. Sistem bilgisi, yerel çevresel bilgi ve çevresel tutum sorularından en yüksek puanı alanların sosyo-ekonomik özellikleri incelendiğinde genel olarak ilköğretim mezunu oldukları ve orta yaş grubunda yer aldıkları görülmüştür.

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LIST OF ABBREVIATIONS

Q-OEQ	Questionnaire based on open ended questions.
Q-CEQ	Questionnaire based on closed ended questions.
IWSA	Istanbul Water and Sewerage Administration

1. INTRODUCTION

Socio-economic structure of a community provides information about the people such as education, gender or income and helps to understand general living conditions of the community in a region. On the other hand socio-economic structure is directly related to the concept of 'environmental awareness' which is defined as a term referring to the ability to perceive or to be conscious of environmental conditions and current environmental state.

Principally, socio-economic indicators show the interest of the population with environmental concern. People who have a certain level of environmental concern are also aware of environmental conditions and probable environmental risks. Environmental awareness is believed to arise with environmental knowledge and develops with socio-economic conditions, priorities and value systems of the people. Education, age, income, gender and residence are the main socio-economic indicators. While education and income are positively associated with environmental concern and also awareness, age is negatively associated with these concepts. Regarding the effect of gender on environmental awareness, it has not been certain for a long time whether men or women have higher environmental awareness. However, today, women are accepted as the gender that has higher level of environmental awareness because of their maternity characteristics and higher level of social responsibility. Urban residents are likely to be more concerned with environmental issues than rural residents are.

Generation and prevention of environmental pollution in a water basin is principally based on socio-economic structures and environmental awareness of the basin population. However, technical approaches have generally been considered as the means of improving the environmental conditions in a basin. This study was conducted to integrate a social approach based on basin population and environmental awareness with the classical environmental management approach.

Hence, the aims of this study were:

- To determine socio-economic structure and environmental awareness level in Küçükçekmece Basin
- To show the relationship between environmental awareness and socio economic structure on the basis of basin population in Küçükçekmece
- To indicate the importance and necessity of integration of public participation for the protection and achievement of sustainability in the area.

The main reason of selection of Küçükçekmece for the study is the existence of Küçükçekmece Lagoon in the region. The Lagoon, its basin and high number of endemic species in the basin exhibit significance of the natural system in Küçükçekmece. Other important characteristics of the basin are its historical and social structure, which have been formed by the effects of different cultures living in the Region within centuries. Moreover, social system in the region can be regarded as representative of Turkey's population with its cosmopolitan structure based on social, economic and cultural characteristics. In spite of all these important characteristics of the region, the Lagoon and its basin are excessively polluted today. The current pollution state of such a significant center, where social and natural systems can be observed simultaneously makes the region an attractive place for an environmental study.

In order to determine the socio-economic structure and level of environmental awareness of the basin population, three methods were used in the study as the following:

- Face to face interviews
- Questionnaire based on open ended questions (Q-OEQ)
- Questionnaire based on closed ended questions (Q-CEQ).

The problems experienced in face-to-face interviews and Q-OEQ led to the development of Q-CEQ. The response and replies received from the people exposed to the first two methods guided the development of multiple choices as the answers of Q-CEQ. The socio-economic structure and level of environmental awareness of the basin population were determined on the basis of answers in Q-CEQ.

Q-CEQ were evaluated by two methods in order to analyse the relationship between variables indicating socio-economic structure and environmental awareness. They were:

- Scoring and
- Stepwise and regression.

During the study, the socio-economic structure, environmental knowledge and environmental attitude of the people living in the region were searched and the effects of the variables pertaining to these indicators on the level of environmental awareness of the people were investigated. According to the results of the investigation, the important socio-economic variables and parameters such as environmental knowledge or attitude were identified for a successful public participation.

2. LITERATURE REVIEW

‘A river basin is the geographical area determined by the watershed limits of the system of waters, including surface and underground waters, flowing into a common terminus’ (Mostert, 1999). Wetlands are multifunctional and dynamic systems and they provide important ecological, economic, and social benefits such as improved water quality, flood control, reduced nutrient pollution and habitat for a diversity of plants and animals and recreational opportunities and economic benefits (Zacharias, 2003; Herath, 2004).

Today, some watersheds, especially in developing countries, are under a heavy pollution load due to a wide variety of reasons such as increasing industrialization, rapid population increase, unplanned urbanization, settlement close to water basins, ‘intensification of agriculture, and unsustainable water uses’ (Zacharias, 2003). The need for achievement of watershed sustainability has been increasing day by day due to the raising water demand with population increase, decreasing water resources and its impacts on not only social system but also ecosystem and bio-diversity.

There are two different approaches that have been developed in order to meet the need for achievement of sustainability. While one of these approaches supports the ‘concept of sustainable development’ that has been mentioned in the literature since 1982, the other one is based on ‘the understanding of ecological sustainability’. According to sustainable development approach, economic development, social development and environmental protection are three targets that are determined for achievement of sustainability (Kates et al., 2005). Sustainability of natural resources has not any priority against economic and/or social development. The protection of natural system is important and necessary for providing the suitable conditions for human survival (Brand, 2009). However, according to ecological sustainability, natural system has intrinsic value (Fogg, 2000). Its protection and sustainability should be provided because of its own characteristics and importance in the whole system not for its role in the survival of human beings.

In ecological sustainability, natural system is regarded as a whole covering social system and economic system. According to this assumption, if the natural system is able to be protected and its sustainability is able to be achieved, the survival of human being and the continuity of main activities that are necessary to meet basic human needs is also provided. The concept of sustainability mentioned here is ‘ecological dimension of sustainability’.

Investigation of development process of two approaches can be beneficial to understand why especially ‘ecological sustainability’ is important for protection of ecosystem.

2.1. Sustainable Development

The concept of sustainability has been mentioned in political arena for the first time in Brundland Report published in 1987 after the World Commission on Environment and Development 1982. The most typical definition of sustainability was announced with this report as ‘development that meets the needs of present generation without compromising the ability of future generations to meet their own needs’ (Kates et al., 2005; Devkota, 2005). The environment and development which were seen as two distinct subjects in political field until 1987 have been reconciled with this report (Spangenberg et al., 2002) and a global debate about sustainability of economy and environment has been started (McCool and Stankey 2004). It has been known that the concept of development in the report included economic and social development and the task was given to the Brundtland Commission ‘to organise a three dimensional optimisation process in order to harmonise the environmental, social and economic dimension of human development’ (Spangenberg et al., 2002).

These explanations show that sustainability has been defined by targeting sustainable development rather than the protection of natural resources.

In the following period, sustainable development was defined as ‘reconciliation of economic, social and environmental needs and wants’ in United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, in 1992 (Spangenberg et al.,

2002). During this conference, development of Sustainable Development Indicators has been begun within Agenda 21 for the evaluation of the applied management strategies and policies (McCool and Stankey 2004) in order to determine whether the countries was moving in sustainable direction (Hanley et al., 1999). Additionally, the institutions was also added to the understanding of sustainability since the importance of good management was recognized for the achievement of targets in this way. As a result of such a modification, sustainability was structured as four dimensions with the indicators which were developed on the basis of environmental development, social development, economic development and institutional development in Agenda 21.

Ten years later, in 2002, at the World Summit on Sustainable Development in Johannesburg, the standard definition of sustainability was extended by the acceptance of three pillars of Sustainable Development, economic, social and environment. ‘Declaration that is made at the end of the Summit, created a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development – economic development, social development and environmental protection – at local, national, regional and global levels’ (Kates et al., 2005).

The approach of economists to sustainability is generally shaped by considering ‘human wellbeing (utility) and if development ‘does not decrease the capacity to provide non-declining/capita utility for infinity’, it is accepted as sustainable. Although capacity of utility is based on four types of capital such as produced, natural, human and social (Dietz, 2007); it is also possible to classify capital into six groups: natural capital (e.g. ecosystems, air, water), cultivated natural capital (e.g. salmon farms, wineries), man-made capital (e.g. infrastructure), social capital (e.g. political institutions), human capital (e.g. skills, education) and knowledge capital (Brand, 2009).

Weak sustainability and strong sustainability are two different sustainability approaches. They have been shaped on the basis of natural capital and show how the approaches of sustainable development are different from each other in terms of priorities given to importance and protection of natural resources.

The Weak Sustainability Paradigm was found in 1970s (Dietz, 2007). According to this approach, utility (well-being) should be provided through intergenerational time scale, natural capital and man-made capital are regarded as substitutes and the stock of the natural capital can be depleted, unless the utility over time is declining. Contrary to this opinion, in Strong Sustainability approach, natural and man-made capital are regarded as complementary, each capital type should be maintained as a whole and natural capital stock should be protected for current and future generations (Brand, 2009).

According to strong sustainability approach, the protection of natural capital is very important because of following reasons. Natural capital:

- ‘Provides the raw materials for production and direct consumption such as food, timber and fossil fuels,
- Assimilates the waste products of production and consumption,
- Provides amenity services, such as the visual amenity of a landscape,
- Provides the basic life-support functions on which human life, as well as the first three categories of natural capital functions, depends’.

These are very important as direct determinant of human welfare and even if the substitution of first three factors is possible under several conditions; it is not possible to substitute the last factor. According to the last factor, environmental and ecologic system is important because it provides the basic functions for human life such as food, water, breathable air and stable climate (Dietz, 2007). According to this approach, existence of sustainability and protection of natural system are aimed for quality of life and survival of human being not for intrinsic value of natural system (Brand, 2009).

Similarly, the first factor supports the protection of natural system because of its effects on social and economic lives of the people as well.

On the contrary to the factors given above to connect the necessity of the achievement of sustainability to maintenance of human welfare, the main aim should be the achievement of sustainability of natural system especially to protect all natural resources from environmental point of view. This view is a result of holistic approach.

According to this approach, if sustainability of natural system is achieved, the conditions suitable for survival of social and economic systems can also be provided.

2.2. Ecological Sustainability

As it has been explained in previous sections, all international studies and agreements, pertaining to sustainable development supports the achievement of sustainable development because of its contribution to continuity of social and economic systems not because of intrinsic value of natural system. This thought is a reflection of *anthropocentric* approach (Fogg, 2000; Kaltenborn and Bjerke, 2002; Karpiak and Baril, 2008). But, if the aim becomes achievement of sustainability based on *ecocentric* approach (Fogg, 2000; Kaltenborn and Bjerke, 2002; Karpiak and Baril, 2008) that believes the intrinsic value of nature, the inappropriateness of anthropocentric approach for protection of natural resources can be found out. The perception of natural system in ecocentric approach can be regarded as the basis of ecological sustainability. Before entering detailed information about principles of ecocentric approach, it can be useful to comprehend how point of view of human being about natural system has been changed from anthropocentrism to ecocentrism in the historical process in order to understand why achievement of sustainability of natural resources on the basis of ecocentric approach is so important.

In Europe, before the sixteenth century, there were organic societies where spiritual and material phenomena were not clearly differentiated, people's innermost perceptions of themselves and their relationship with their environment were valuable, the act of observation was not divorced from the observed, the support of natural world to survival of human being was repaid by nurturing and recreating the land, and intuitive knowledge became important. In these societies, there was a life style based on participatory consciousness supporting the existence of a mutually sustaining cycle (Hamilton, 2002).

In seventeenth century, science replaced religion and the approach of human being to the nature was changed with development of mathematical formulation of the new mechanical view of nature by Newton and European Enlightenment Period based on scientific and industrial revolution.

In this period, religious certainties came under attack and religious dogmas became ineffective under the strength of scientific reason. The estrangement of the religious and physical worlds was followed by the separation of inner (numinous) and outer worlds of the people. While objective reality (world) was certainly accepted as true, subjective realities were regarded as unscientific, irrational and unimportant. Achievement of socially accepted forms of success became much more important than development of inner worlds of people. In such a new structure, called as consciousness of non-participation, while the expression of rationality was based on intellectual knowledge; rejection of intuitive knowledge led to the impoverishment of inner worlds of people (Hamilton, 2002).

The effects of this approach, based on rationalism, was seen in economic world as well as in relationships with the environment. In this approach, economic activities were only based on the calculability of results and natural world was only treated as a place in which the economic agents find resources to meet human desire. Human beings are almost accepted as creatures without feelings in such a worldview. This worldview is a result of (associated with) anthropocentric approach that was firstly introduced in 1860s. According to this view, human is the center of and the most significant life form of the universe (Kortenkamp and Moore, 2001). Nature and other life forms deserve the protection according to results of the evaluation about their benefits and harm to the human being. In such an approach, nature has no right to be protected with only its own characteristics.

As the opposite view, ecocentrism approach was firstly introduced in 1913 and developed 1990s. On the contrary to anthropocentrism, considering how the policy will affect the well-being of the people in the future; ecocentrism asks how the policy will affect the natural environment in the future (Barkin, 2005). According to this approach, the nature has intrinsic value as independent of its benefits to human being. The aim should be protection of integrity, balance and beauty of all biotic organisms (Fogg, 2000). Ecocentrism supports ecological sustainable development based on closed cycle economy in which society's aggregate use of resources are ultrafrugal and material flows into and out of society are not systematically increase (Sutton, 2000). For achievement of sustainability in such a development understanding, societies should be in harmony with nature by integrating ecological thinking into social and economic policies.

Such a point of view and understanding of sustainability may provide the suitable conditions for protection of natural resources as independent from their benefits to the social and economic lives of the people. The benefits of natural resource sustainability is carried into the social life as well as economic life within the interaction between natural system and social system.

2.3. Interaction Between Natural System and Social System

Ecosystem is a whole covering different kinds of biotic organisms and their abiotic environment. This main system covers both *social system* and *natural system*. While the former is formed by human based groups such as families, communities and several institutions (Bulut); the latter is formed by the relationships of non-human elements and it is based on their own dynamics and abiotic, biotic, biological and/or chemical processes (Principles of ICZM).

Social system and natural system have always a reciprocal, double-sided relationship, based on their positive and adverse effects on each other.

2.3.1. Impacts of Natural System on Social System

Human being has to meet his needs such as food, water and shelter to survive. He is benefited from the natural resources which are supplied by environmental conditions for meeting these basic needs (Me-Bar and Valdez, 2005). This is the first and the simplest form of the relationship between two systems and it shows the positive effects of the environment on the life of the human being.

While the natural system helps the continuity of the human life by the benefits, supplied by it; on the other hand, it has the ability to create the conditions which threaten the human life, through natural phenomena such as earthquake, drought, volcanic eruption (Me-Bar and Valdez, 2005) or climate changes (Rockström, 2003). Such environmental phenomena lead to both very serious environmental changes in natural life and results in social life on the basis of these mentioned changes. The human being who interacts with natural system, experiencing important changes, has also to make some changes in his social and

economic life to survive such as use of new natural resources instead of rarely found natural resources after the environmental phenomena. The mentioned environmental phenomena can affect the societies either directly with the results at the occurring time or indirectly with the changes, seen in the human life.

2.3.2. Impacts of Social System on Natural System

Another side of the double-sided relationship between human being and environment is the effects of social system on natural system.

Human being who is core of social system has to feed, meet water and shelter need in order to survive as it was mentioned before. In order to fulfill all of them, he or she uses the natural resources in the natural system and the initial form of his effects on the natural system appears as reduction in natural resources and also consumption of some of them in the long run.

Additionally, human being may have indirect role in the generation of some environmental phenomena through his some decisions and behaviors (Rockström, 2003). He can lead to serious changes in the stability of the ecosystem by causing some perturbations in the long run through these behaviors.

Human population not only plays a role in reduction of the natural resources and destabilization of the ecosystem but also leads to reducing absorb capacity of the ecosystem against environmental shocks by some uncontrolled social phenomenon such as population growth, uncontrolled industrialization or poor land management (Rockström, 2003).

As a result, human being affects natural system by consuming natural resources, generating environmental shocks and making it weaker against the consequences of environmental perturbations.

Based on the effects of social system, the changes in natural system, can affect social system as a natural result of the influence of natural system on the social system in return.

Under these conditions, it can not be wrong to accept that the cases in which two systems, natural and social, reciprocally affect and changes each other, continue as long as both of them exist.

The chain of the relations between two systems makes necessary taking into account all variables and phenomenon both in social system and natural system, the effects of these variables and phenomenon in the systems where they exist and interaction between two systems in studies made for the achievement of sustainability. Hence, achievement of sustainability is *a complex process* including a wide variety of variables.

The existence of social system in ecosystem, as one of the factors leading to complexity in achievement of sustainability, is important because of not only the results of the human behavior in social and natural systems but also its formation process.

While *behavior* refers to the ‘any kind of movement in a living organism’ (Kolb and Whishaw, 2001); *human behavior* which has a role in the formation of interaction between two systems, can be defined as ‘the collection of behaviors exhibited by human beings. It is influenced by culture, attitudes, emotions, values, ethics, authority, rapport, hypnosis, persuasion, coercion and/or genetics’ (Human behavior, wikipedia).

Literature on this issue clearly shows that some models have been developed to explain the generation of human behavior such as Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Moral Norm Activation Theory (NAT), and Value Belief Norm Theory (VBN).

In the study that is developed by Stern who has become one of the most important names in this area by developing Value Belief Norm Theory with his colleagues Dietz by linking Value Theory, New Environmental Paradigm (NEP) and Norm Activation Theory (NAT), the factors; shaping human behavior, can be seen within four main groups (Stern, 2000).

The first group includes ‘*attitudinal factors including norms, beliefs, and values*’. ‘Which attitudinal factor is effective on what kind of behavior’ can be given separately

according to the models whose names are mentioned above. Additionally, behavior specific beliefs like the difficulty of taking certain actions or their consequences for self, for others and for the environment, personal commitment, perceived personal cost and benefits of particular action are the other components of attitudinal factors affecting formation of human behavior.

The second group, including the components affecting human behavior, consists of the factors indicating '*legal, institutional, technological, and economic states of the societies*' like government regulations, community expectations, other legal and institutional factors and technological innovations.

While the second group includes the current conditions in the general society; the third one is closely related to the individual characteristics of the people. This group shows '*personal capabilities of the people*' such as knowledge and skills, time availability to act, literacy, race and social status.

The last one shows '*habits and routines*'. They also play a role in the formation of human behavior and their effects are seen as out of control not only in personal scale but also in societal scale.

These groups which include effective factors, shaping human behavior are important to show the diversity of variables, taking role in formation of human behavior.

The diversity of these factors is important for demonstration of variety of features pertaining to human being which should be taken into account during the evaluation of social system and for justification of complexity of achievement of sustainability on the basis of this situation.

The determination of the method for achievement of sustainability gains importance at this point.

The studies which were made for prevention of environmental pollution, solution of environmental problems and sustainability of natural resources were based on top-down

approach until 1970s (Yenal, 2004). The ways of solution of environmental problems were identified with the environmental policies that were determined according to power and authority of central authorities in this approach. According to this understanding, there was no right of experts in environmental issues or public that was affected by environmental deterioration to express his idea during the studies made for environmental protection. The increasing environmental pollution has showed the insufficiency of this approach for the effective applications towards environmental protection. Consequently, bottom-up approach which is based on cooperation of experts in environmental issues, NGOs and public with central authority has gained importance in efforts made for environmental protection (Yenal, 2004). Participative approach has been created under the effect of this approach.

Participation is a process in which people involve decisions or applications affecting their personal life conditions or environment, individually or as a group (Maurel et al., 2007).

The main reasons of destabilization in any natural system are based on the behaviors, way of living, priorities and value systems of human being forming social system in this natural system. The role of the local community in environmental deterioration in any natural system makes necessary the participation of these people into the studies made for environmental protection. The importance of these studies in the achievement of sustainability and difficulty of finding the correct method for gathering the people who have different socio-economic structures, attitudes, priorities, knowledge and awareness for environmental protection are other factors illustrating the complexity of achievement of sustainability.

2.4. Determination of Current Situation in Natural and Social Systems: The Principal Aspect for Providing Watershed Sustainability

The initial form of the relationship between water basins and human beings has emerged during meeting the water needs of the people in daily life. Increasing human population and the appropriateness of the conditions in the water basins have made the basins suitable areas for settlement in time.

Unplanned urbanization and industrialization, based on increasing population, and the negative environmental effects of these events in the basins have eventually led to the destruction of the natural balance in these areas. At this stage, what should be done have to be determined certainly. It is clear that human being needs water resources due to a wide variety of reasons such as social, economic or politic during all his life. Besides, the protection of stability and sustainability in water basins is a necessity for the sustainability of natural life in these areas. As a result, it is necessary to protect water basins effectively for the continuity of both, natural and social systems. Environmental protection of and achievement of sustainability of the basins can become possible with the consideration of the complex structure of the relationship between two systems (natural & social) and the internal dynamics of each system.

The selection of the correct practices to prevent environmental pollution and problems in the basin are closely related to the determination of current situation in the basin clearly. The current situation in the basin can be determined on the basis of

- The conditions in natural system which are shaped on the basis of the elements of water, soil and air and biodiversity; and
- Social system which is formed by the local people in the basin.

Consequently, the possibility of determination of the methods for prevention of adverse environmental effects correctly increases as much as the factors such as

- Natural system which is shaped by the borders of the water body in a basin, the location of the streams feeding the water body and the species within the water body;

- Social system which is shaped by the education, age, gender, income, decisions and applications of the people who can be classified as three groups such as living in the basin, working in the basin and having an authority for the environmental protection in the basin
 - The amount of the pollution in the water body as an indicator of effects of social system on natural system; and
 - The variety of ways used to benefit from natural system
- are analyzed correctly.

One of the most important factors for achievement of sustainability in any basin is existence of basin population which takes role in development and application of projects for sustainability in the basin. The environmental awareness of the population, its environmental knowledge, environmental concern, politic approach and socio-economic structures are important factors in the effectiveness of such an approach.

2.4.1. Socio-Economic Structure

Gender, education, age and income are the socio-economic elements that form the framework of the capability of the people to benefit from the resources supplied by natural system, to survive against the threats in natural system and to make decision and to shape behaviors which can adversely affect natural system. Therefore, it can be considered that the role of the people in the interaction between natural system and social system is also determined on the basis of these socio-economic characteristics.

2.4.2. Environmental Awareness

Environmental awareness is another characteristic of the people. It is a term referring to the ability to perceive or to be conscious of environmental conditions and current environmental state. Environmental awareness is affected by the socio-economic conditions and may play a role in the generation of the effects of the social system where the people live, on natural system.

Today, the factors such as population increase, unplanned urbanization, and rapid industrialization and environmental pollution and problems based on these factors create a serious load on the whole ecosystem. This situation leads to the problem of scarcity for some sources in natural system. Such a problem can cause the formation of some threats to the survival of the human population forming social system in the long term.

If the human being who is core unit of social system, has a certain level of environmental awareness, he can comprehend the problem of scarcity in natural system and reduce the adverse effects of the social system on natural system by making some changes in human behaviors towards the protection of the ecosystem.

The determination of the relationship between environmental awareness and main components of socio-economic structure such as education, age, income, gender or being urban or rural based in any region may be an appropriate approach to understand how the socio-economic structure in that region perceive the natural structure in the same area.

Actually, education, age, income and gender are the factors affecting environmental concern of the people. High environmental concern in a society shows the presence of human beings who are deeply interested in the environmental matters and have high level of environmental awareness. As a result of such a link between environmental concern and awareness, the factors, associated with environmental concern, can also be accepted as directly related to environmental awareness (Üstün and Celep, 2008).

Hence, while education and income are positively associated with environmental awareness, age has negative association with environmental awareness. Regarding the effect of gender on environmental awareness, it has not been certain for a long time whether men or women have a higher environmental awareness. However, today, women are accepted as the part that has higher level of environmental awareness because of their maternity characteristic and higher level of social responsibility when compared to men.

2.4.3. Environmental Knowledge

Knowledge is a necessity in realization of successful action in every fields from economics, health, tourism to environment and in promoting certain behaviors within general public.

The knowledge, needed for development of appropriate behaviors for environmental protection and prevention of environmental pollution and problems, can be explained into three groups such as:

- System knowledge
- Action Related Knowledge
- Effectiveness Knowledge

System knowledge is knowledge, including information about general environmental problems and explaining how ecosystem operates. It can be defined as ‘knowing what’.

Action related knowledge can be defined as ‘knowing how’ and it is knowledge of behavioral options and possible courses of action for the solution of the environmental problems.

Environmental effectiveness knowledge ‘addresses the relative gain or benefit that is associated with a particular behavior’. It can also be defined as ‘relational knowledge’, ‘task knowledge’ and ‘impact knowledge’ (Frick et al., 2004).

Naturally, each behavior that is proposed on the basis of action related knowledge for the solution of problems can be effective at different scales.

Finding the most beneficial way in dealing with environmental problems can be possible with effectiveness knowledge. If people have effectiveness knowledge about behavioral options; they can choose the correct behavior for the solution of existing problems.

Shortly, action related knowledge becomes usable (functional) through effectiveness knowledge. On the other hand, people should be knowledgeable about behavioral options for solution of problems through action related knowledge at the first stage. ‘Without knowledge of behavioral options, no effectiveness knowledge can be usefully accumulated’ (Frick et al., 2004).

The impact of system knowledge on human behavior is different from action related and effectiveness knowledge. Although system knowledge is regarded as essential to motivate a search for action-related knowledge and to generate effectiveness knowledge as well, it is not directly effective on human behavior as much as the others, action related and effectiveness. ‘Action related and effectiveness knowledge forms are believed to affect behavior more proximally than system knowledge’ (Frick et al., 2004).

The three types of knowledge that explain natural processes in ecosystem, environmental problems and their solutions, are based on the information that is obtained by the studies in modern sciences. However, knowledge is not a concept that can be generated only within the framework of modern sciences.

There is also another kind of knowledge including perceptions and explanations about geomorphology, landscape classifications, settlement strategies, soil-water-plant relationships and range management (Verlinden and Dayot, 2005) in the field of environmental knowledge besides three types of knowledge mentioned above. It is gained by what people learn from and experience in the relationship with the environment where they live and called as *indigenous knowledge* by Kargbo (Kargbo, 2005).

Indigenous knowledge which indicates knowledge, skills and technology gained through direct interaction of local people with environment and five senses (Verlinden and Dayot, 2005) includes information about various areas such as folklor, ecology, knowledge of the land, religious knowledge systems or linguistic knowledge system (Kargbo, 2005).

The area of use and acceptance of Indigenous Knowledge has been increased since the critiques towards modern sciences because of ignorance of cultural dimension of technological developments in modern sciences, their anti-ecological characteristic and

conversion of modern sciences into an interdisciplinary structure due to acceptance of biological, psychological and social phenomenon pertaining to an interdependent system (Verlinden and Dayot, 2005).

In addition to System Knowledge, Action Related Knowledge and Effectiveness Knowledge, the existence of Indigenous Knowledge that is transferred from generation to generation by local people should not be forgotten in the environmental studies, made for a particular area.

2.4.4. Environmental Attitude

With a general approach, attitude can be defined as ‘positive or negative judgements about some object or phenomenon (Larson and Lach, 2008). With a similar expression, it shows ‘positive or negative feelings about performing the target behavior’ (Han, 2003). Its formation depends on the consideration of the possible consequences of the behavior and their evaluation (Barr, 2004).

‘An attitude toward any given object, idea, or person is an enduring orientation with cognitive (conscious), affective (emotional), and behavioural (conative) components’ (Zsoka, 2006). These components are significant as the qualities of three concepts, used in the explanations made for the structure of the environmental attitude. These three concepts are *Place Identity*, *Place Attachment* and *Place Dependence*.

Place Identity (PI) “involves those dimensions of self that define the individual’s personal identity in relation to the physical environment by means of a complex pattern of conscious and unconscious ideals, beliefs, preferences, feelings, values, goals, and behavioral tendencies and skills relevant to this environment” (Kyle et al., 2004; Jorgensen and Stedman, 2001).

Place Dependence (PD) concerns “how well a setting serves goal achievement given an existing range of alternatives. A place can be considered important to an individual because of its functional value” (Kyle et al., 2004).

As the last concept, *Place Attachment (PA)* can be defined as “a positive bond that develops between groups or individuals and their environment” (Jorgensen and Stedman, 2001).

PA, PI, and PD are very effective in both the social and environmental evaluations of the people towards the place where they live and determination of the responses of these people towards these places (Kyle et al., 2004). PA, PI, and PD are affective, cognitive, and conative compounds and they are shaped by emotions & feelings, beliefs & perceptions, and behavioral intentions respectively (Jorgensen and Stedman, 2001).

While the acts of the human beings are sometimes cognitive based, sometimes they are emotional based. One of these domains can not replace the others and although they have relationship with each other, they are independent. Because these domains determine the structure of the environmental attitudes of the people, they also have a vital role in their behavior which is shaped on the basis on their attitudes.

The factors which are effective in the formation of attitude that shapes the behavior of the human being, are not just whether they are emotional, cognitive or conative based. Another important thing which should be analyzed is the value system of the people.

What objects have the priority in the value system of the people is an important factor as much as emotion, belief or behavioral intention in the shaping of the attitudes of the human beings towards the items in their environments.

In this approach, the values were investigated as the basis for environmental attitudes and *a value basis theory for environmental concern* was developed by Stern and Dietz (Schultz, 2001). According to this theory, three kinds of environmental attitudes are the result of the set of values of a person: Egoistic, Social – altruistic and Biocentric.

“*Egoistic environmental attitudes* are based on beliefs about the effect that environmental destruction may have on the individual.

Social-altruistic environmental attitudes are based on human benefits or human goals. Protection the environment is important because of the long-term consequences it may have on other people.

Biocentric attitudes center on the inherent value of the natural environment. Humans should not harm nature because they are a part of nature; species have a right to continue; nature has intrinsic rights broader than mere species survival” (Schultz, 2001).

2.4.5. Environmental Concern

In the last century, while scientists have studied the reasons of increasing environmental problems and explored appropriate solutions to prevent anthropogenic effects to environment, social psychologists have investigated “general attitudes about environmental issues” (Schultz and Zelezny, 1999). They measured “an individual’s degree of concern for human caused environmental problems” through a variety of scales developed by Weigel and Weigel (1978), Lounsbury and Tornatzky (1977), Maloney and Ward (1973), Maloney *et al.* (1975), and Dunlap and Van Liere (1978) (Schultz, 2001).

As it has been mentioned above, *a value basis theory for environmental concern* was developed by Stern and Dietz (Schultz, 2001) and environmental attitudes was determined as Egoistic, Social – altruistic and Biocentric. These attitudes are accepted as the basis for *environmental concern* (Snelgar, 2006) and are also known three distinct bases as the individual, all people, and all living things (Schultz and Zelezny, 1999).

Environmental concern has been associated with socio-economic and demographic variables such as age, education, gender, income, residence, and political ideology of respondents.

Education, income, age, gender and residence are the main indicators of socio-economic situation of people. The explanation of the relation of environmental concern to these indicators can be useful to understand the formation of environmental concern better.

Environmental concern and education are positively associated with each other (Gökşen et al., 2002; Dietz et al., 1998). The positive impacts of education on environmental concern of the human beings are linked to the contributions of education to the relationships of people with the outside world.

As it was explained in previous years, with the raising education level, people have improved ability to comprehend complex environmental problems as a result of a higher level of awareness of public affairs based on increasing cognitive skills. With education, people can come into contact with other individual's who have different values, opinions and worldviews and become more open to new ideas and value systems. Such an improvement makes easier the acceptance of environmentalism for these people (Yılmaz et al., 2006).

Environmental concern is positively associated with income. The priorities of lower income people are more likely to meet the basic needs of their own or families and concern for environmental issues can be ignored when compared with meeting these basic needs. However, higher income people have the proper conditions for meeting the basic needs such as adequate nutrition or health care (Yılmaz et al., 2006). That's why, it is much more possible to be interested in environmental issues for them when compared to the lower income people.

Age is the strongest and most consistent predictor of environmentalism (Dietz et al., 1998). It is negatively associated with environmental concern. The control of environmental pollution and solution of environmental problems make necessary some structural changes in the society. While the older people are not open to new ideas and they do possibly not want to change the existing system, the young people are ready to and enthusiastic for new world views and value systems and they easily support the birth of new issues like environmental concern (Yılmaz et al., 2006).

There was no a certain idea about who has stronger environmental concern: men or women for long years.

Actually, men have become in education life and more active in social life for longer years when compared to women. That's why, it is expected that men are much more concerned with environmental issues than the women. But, because of the father effect and having opportunities for monetary gains for long years, meeting the economic needs of their families are much more important for the men than becoming concerned with environmental issues. The situation is different for the women. The environmental problems or pollution can lead to the generation of conditions threatening the life of their families. As a result of mother effect and generally having much more social responsibility than the men, they prefer to be concerned with the environmental issues (Erdur, 1996).

Urban residents are likely to be more concerned with environmental issues than rural residents because of two reasons: They are exposed to environmental pollution more than the people in rural areas and they may have an exploitative orientation towards the environment being involved with rural occupations such as farming and logging (Güleç, 1997).

In recent years, numerous studies has been made about the effects of environmental attitude that is one of the concepts found in models developed for explanation of formation of human behavior, and environmental knowledge that is regarded as essential for an environmental behavior, on development of environmental concern and behavior in human beings (Barr, 2004; Bamberg and Möser, 2007).

The positive relationships between environmental behaviors and these variables show that the conversion of negative environmental attitude to positive one, having environmental knowledge or increase in the existent environmental knowledge, and generation of environmental concern or rise in the existent environmental concern are very important for the development of pro-environmental behavior. For the achievement of these items, participation to an active involvement process during a public participation application can be one of the most effective ways.

2.5. Public Participation

Participation is a process in which people involve decisions or applications affecting their personal life conditions or environment, individually or as a group (Maurel et al., 2007).

Public participation which has been taking place in the studies about natural resources increasingly since the last days of 1960's and 1970's (Larson and Lach, 2008), have become a rising value in numerous fields from health to environment especially in recent years (Tippett et al., 2005). Today, the multi-dimensionality of reasons and effects of problems related to water resources makes necessary some changes and integrated solutions in the studies, made for these resources. Such a necessity leads to the generation of need for use of public participation also in control of water resources.

As a result of these events, The European Water Framework Directive (WFD) was prepared in 2000. In this directive, the necessity of supporting of active involvement of public especially in preparation of management plans for river basins, their review and update is determined.

According to the Directive, different participation types have different degrees of involvement. Although there are three types of participation for the management of river basins in the Directive, such as:

- Information supply
- Consultation (plans and options are made available for comments)
- Active involvement.

The active involvement model of participation is especially required from the member states (Tippett et al., 2005; Maurel et al., 2007).

The interested parties in this participation model are called as 'stakeholder'. Stakeholders may be any person, group or organisation with an interest or "stake" in an issue either because he/she will be affected or because he/she may have some influence on

the outcome. The typology of stakeholder for active involvement in river management includes professionals, authorities and elected people, local groups and non-professional organized entities and finally, individual citizens, farmers and companies representing themselves (Maurel et al., 2007).

The important thing in such a participation is not only making decisions by involvement of all parties but also providing of participation of different stakeholders into the process where different options are developed before making decision rather than just being aware of the decisions made by experts and authorities without any involvement of public. The generation of appropriate conditions for such a process and changes and improvements in the way of thinking of stakeholders thanks to the things learnt about the related issue and each other form the core of active involvement.

The process which is based on adaptation to changing conditions due to correction of existing faults and changing underlying norm and processes in the current structures during adaptation process by considering the changed conditions, was developed in 1970s. The process was accepted to be based on 'double loop learning' concept. Such a process that enhances the ability of groups to change underlying dynamics and assumptions is called as Social Learning (Tippett et al., 2005).

The multi-dimensional structure of protection of natural system, its complexity and uncertainties based on the interaction of social system with natural system lead to the generation of need for having ability to adapt to changing conditions and formation of social learning process.

The people in active involvement have a certain mental models and frames. While mental model is defined as 'a specific mental representation of information about reality'; a frame is defined as 'the context into which such a mental model is embedded and which gives sense and meaning to it'. The people in active involvement evaluate the whole process according to their frames which are shaped by the reason of being there, the fields of their expertise and their experiences (Tippett et al., 2005).

The participants learn key issues affecting their areas, obtain new skills, improve their frames and realize how their personal concern affects the whole system or vice versa through social learning during active involvement. In addition to the benefits of social learning at personal scale, the communication among the different actors is also developed by social learning. Such a new form of communication may lead to the formation of new communities with improved social relations. New representations and new meanings of realities can be seen in these communities (Maurel et al., 2007, Tippett et al., 2005). At the end of such a process, a society, consisting of people who have much more developed qualities, can be formed when compared to earlier one.

The explanations given above clearly show the benefits of public participation for not only for individuals but also for the whole society and indicate how it is effective in the development of social system.

Furthermore, such a process in an environmental study including public participation positively affects not only social system but also natural system since the decisions that are made with more extensive viewpoints, can lead to higher quality solutions for environmental problems.

When the impacts of social system on natural system is considered, it is expected the people to perceive social system and natural system as a whole and to evaluate the social and environmental dimensions of their own behavior from a much more extensive framework in the societies where an improvement process is seen thanks to public participation as mentioned above. Reaching such an evaluation state can be important to understand the magnitude of the role of public participation in the improvement of the interaction between two systems.

The generation of all probable positive impacts of public participation on social and natural systems may not be possible in every application process. In addition to the long time need for generation of benefits of application of public participation, some misapplications or deficiencies in public participation process can either prevent the generation of these benefits or decrease their intensity.

One of the key principles of public participation is to develop plans and projects by taking into account the view of the people at the lowest level as well. Disregarding this principle is one of the deficiencies in the applications. It has been shown in some studies made in some European countries that while people who are not within the privileged part of the social structure can not find opportunity to take place in participation process, the people who have power and authority in the society are provided some advantages making their position more efficient, in the participation process (Nare et al., 2007). Such a situation is completely opposite to the targets of public participation.

Another misapplication related to public participation is especially invitation of the people from organized groups who express its interest in the related issue to the participation process. As a result of this situation, interests are represented in the participation instead of individuals and the representation of other interests or broader public can not be possible in such a structure. That's why, the results opposite to the philosophy of public participation can be seen (Larson and Lach, 2008).

In addition to the misapplications mentioned above, there are some issues which should be taken into consideration in public participation in order to prevent some problems.

As mentioned before, public participation provides an opportunity for the people or groups who have different frames, to come together. Even if people live in the same region, they can not have the same opinion or attitude towards the environment (Larson and Lach, 2008). Different viewpoints can lead to conflicts among these groups or between these groups and governmental authority (Tippett et al., 2005).

Another important issue in public participation is making decision about what kind of people is invited to the process as participator. The people or groups whose participation are rejected can cause some problems for a sense of legitimacy of the process and acceptance of results. That's why, the selection of parts should be made with a great care.

Consequently, benefits of public participation can lead to acceptance of public participation as a very useful application for the improvement of social system and

protection of natural system. However the factors such as some misapplications and deficiencies in public participation studies; a long time need for the generation of positive effects of public participation in human beings and their transfer from individuals to whole ecosystem including social and natural system, multidimensionality of public participation based on existence of high number of stakeholders and lack of certain framework for the methods of correct and effective participation can cause some troubles in public participation applications.

3. KÜÇÜKÇEKMECE BASIN

Küçükçekmece water body is one of the limited number of lagoons in the world and a very important water resource in Turkey. But, today, it suffers heavy pollution due to unplanned urbanization, uncontrolled industrialisation and exclusion from basin protection area between 1984 -1997. Although it is such a valuable water resource, the current pollution state in the Lagoon and the Basin makes this Region a preferred place for such a study aiming to indicate the interaction between environmental pollution and local people in an area like Küçükçekmece.

The method of study involves a case study in Küçükçekmece Basin, using interviews and questionnaire methods followed evaluation of results.

3.1. Description of the Selected Region

Küçükçekmece Region, which covers Küçükçekmece Lagoon, its basin and 28 neighborhoods, is located in Istanbul. The lagoon is characterized by its naturality and by being a drinking water resource.

The importance of the region is based not only on the existence of Küçükçekmece Lagoon but also on its historical and social structure, which have been formed by the effects of different cultures living in the Region within centuries. Küçükçekmece Region, which gains importance with its historical identity and existence of natural lagoon within its borders, is one of the most significant centers where social and natural systems can be observed simultaneously.

Another important characteristic of the Region is its cosmopolitan social structure based on migrations from different cities of Turkey into the Region. As a result, the prototype of population distribution in Turkey is present in Küçükçekmece Region. Hence, the results obtained and the evaluations made here can be accepted to represent Turkey as a whole.

Unfortunately, in recent years, Küçükçekmece Lagoon and Basin has been a watershed which is excessively polluted and most of the species seen in the Lagoon in earlier years has been lost due to the some inappropriate applications although all valuable characteristics of the Region mentioned above.

This study was aimed 1) to show the relation between environmental pollution/problems and social structure in Küçükçekmece Basin; 2) to relate environmental awareness and socio-economic structure of the population and their relationship to each other; 3) to indicate the importance and necessity of public participation for the protection and achievement of sustainability in the area.

The characteristics and current situation of natural system in the Basin, the formation process of social system in the Basin and the structure of the population as the base of this system have been determined through field studies based on questionnaires and monitoring since 2002.

Küçükçekmece Lagoon and Basin which have a high biodiversity in the past is one of the significant water resources in Turkey as well as being one of the distinctive lagoons in the world if protected properly. Bearing in mind the strong historical and social identity of the area, which represents a small scale model of the population characteristics of the country, results obtained in this study indicate the degree of detrimental effects on the environment if care is not given to protection. Moreover, the study carried out points out the effect of existing environmental problems on the interaction of social system and natural system not only with their origins but also with their consequences. Furthermore, this study reveals the role of social system on the existing environmental conditions, implying responsibility of the residents to the improvement and sustainability of such an area.

3.2. Natural Structure of Küçükçekmece Basin

Küçükçekmece Basin covers an area of 340 km² with Sazlıdere Dam together. It has a very important natural system because Küçükçekmece Lagoon which is one of the small number of natural lagoons in the world exists within the Basin. The surface area of the Lagoon is 15.22 km² and it is connected to the Marmara Sea through a narrow channel which is 1 km in length and 1.5m in depth (Taner, 2007).

Küçükçekmece Lagoon is fed by three streams, called as Nakkasdere, Sazlıdere and Eskinoz.

The whole Küçükçekmece Region with the Lagoon and streams feeding the Lagoon has become a region where a heavy pollution load and several environmental problems exist, because of some misapplications and negative changes in social system and some adverse phenomenon in natural system, occurring as a reaction to changes in social system.

The determination of current situation of Küçükçekmece Basin in terms of environmental pollution and problems in natural system within the region is important to find the reasons of these pollution and problems in association with the social system and to show the interaction of two systems, natural and social, in the basin by this way.

3.3. Social Structure of Küçükçekmece Basin

Today, in Küçükçekmece Region where settlement has been increasing since 1950's, 785.392 people live according to last census in 2007 (Küçükçekmece Municipality Home Page).

The rise in total population in Küçükçekmece, where settlement and industrialization have been increasing uncontrollably, is a result of migrations from several cities in each region of Turkey into Küçükçekmece. The dates of the migrations into Küçükçekmece Region are the same dates of the general migration waves in Turkey.

The first migration wave into Küçükçekmece was realized in 1950's by the people coming from Eastern European countries such as Bulgaria and Romania. The findings from field studies and questionnaires made in the Basin show that rare settlement, very clean Küçükçekmece Lagoon, widespread natural beauties in the Basin and railway facilitating transportation had made the Region an attractive place for settlement in 1950's. People coming from some regions in Anatolia in that period are within in the migration wave from villages to cities until 1980s.

The second migration wave towards Küçükçekmece was seen in 1980's. This is the period when migrations were made from small and middle scale cities to the big cities in Turkey. In that period, people from cities particularly in Blacksea, Marmara and East Anatolia and then, other regions of Turkey migrated into Küçükçekmece Region.

While the need for human in agricultural activities was decreasing because of the mechanization in agriculture in villages; new business areas were emerging due to the increasing industrialization in cities in 1980's. In these years, Küçükçekmece was an attractive place for people because of the proximity to the business areas due to increasing industrialization in the Region, inexpensive houses and lands and relatives who came Küçükçekmece in earlier years.

Küçükçekmece has been under the effect of migrations especially from East and South East Anatolia since the second half of 1990's. The main reasons of these migrations are safety problems based on terrorist activities and unemployment due to poor social and economic conditions in these regions.

The formation process of population profile in Küçükçekmece Region shows that the migration movements towards Küçükçekmece have a parallel structure to historical process of migration waves in Turkey (Apan, 2006). 1950's, 1980's and especially the second half of 1990's which are important dates in history of migrations in Turkey, are also the dates when the most intensive migrations were seen towards Küçükçekmece Basin. In these three migration periods, migrations into Küçükçekmece Region have been made from villages in Eastern European countries and some parts of Anatolia to the urban areas (cities); from generally small and middle scaled cities to the big cities; and lastly

from East and South East Anatolia to the big cities, respectively. As it has been explained above, the structure of migrations into Küçükçekmece is parallel to the general migration profile in Turkey.

According to the results of fields studies made in the Region, the information about the relationship between the hometown of people and their duration of living in Küçükçekmece can be shown in Table 3.1.

Table 3.1. Relationship between hometown of participants and their duration of living in Küçükçekmece Basin according to Q-CEQ

Question 11	(1) year < 10	(2) $10 \leq \text{year} \leq 20$	(3) year > 20	Blanks
Question 8				
Black Sea 787	212 26.9 %	354 44.9 %	132 16.7 %	89 11.3 %
Marmara 408	82 20.0 %	122 29.9 %	169 41.4 %	35 8.5 %
Aegean 44	15 34.0 %	15 34.0 %	8 18.1 %	6 13.6 %
Meditereanean 54	30 55.5 %	20 37.0%	3 5.5 %	1 1.8 %
South East 143	75 52.4 %	43 30.0 %	9 6.2 %	16 11.1%
East Anatolia 522	135 25.8 %	220 42.1 %	109 20.8 %	58 11.1 %
Central Anatolia 265	72 27.1 %	113 42.6 %	52 19.6 %	28 10.5 %
Abroad 80	11 13.7 %	35 43.7 %	27 33.7 %	7 8.7 %

According to this study, the first inhabitants in Küçükçekmece came from either several cities of Marmara Region or abroad like Rumelia and Bulgaria to Küçükçekmece Region more than 20 years ago. Majority of the people who have been living in Küçükçekmece from 10 to 20 years, have come from Black Sea, Middle and East Anatolia or abroad. The rest of the people have been living in the Region for less than 10 years and they have come from Mediterranean and South East Anatolia.

As it is seen with general evaluation, while the migrations from Marmara Region and abroad to Küçükçekmece have been decreasing within the years; the migrations from Mediterranean, South East and Aegean Regions have been increasing continuously. Apart

from the others, migrations from East and Middle Anatolia have been decreased in last years although it had been raised in earlier years.

As a result of these migrations, today, Küçükçekmece is a region where uncontrolled and unplanned urbanization and social discrimination exist. Moreover; there is a wide variety of industrial facilities from metal to chemistry in Kayabaşı, Firuzköy; and Hadımköy Districts in Küçükçekmece Region. These facilities create a large number of employment field. However, the wastes coming from these industrial facilities, their uncontrolled discharges into the Küçükçekmece Lagoon and streams feeding the Lagoon and domestic wastewaters from unplanned urbanization cause very serious environmental problems in Küçükçekmece Region.

The negative changes in general structure in Küçükçekmece are very important and should be taken into consideration seriously for sustainability of Küçükçekmece Lagoon and Basin as much as for survival of population living there.

3.4. Sources of Pollution in Küçükçekmece Basin

The sources of environmental pollution in Küçükçekmece Lagoon and basin can be divided into two groups by considering the interaction between social and natural systems.

The sources indicating the pressure of the social system on the natural system (Ağcıoğlu, 2004) are:

- Rapid population increase
- Unplanned urbanization
- Uncontrolled industrilization
- Insufficient infrastructure
- The construction of Sazlıdere Dam
- Illegal dumping into the Lagoon area
- Keeping Küçükçekmece Basin out of basin protection between 1984 – 1997 (Üstün et al., 2005) and since 2006.

Occurrences showing the reaction of natural system to pressures of the social system are:

- Deterioration of water and sediment quality in Lagoon and the streams
- Eutrophication
- Formation of reed beds
- Replacement of endemic species by rude species (Üstün et al., 2005).

Local people are the part which is affected mostly by the adverse impacts of natural system on social system within interaction between the two systems.

Local people in Küçükçekmece Basin not only play a role in the formation of environmental pollution and problems in the basin but also are affected by the pollution. Hence, in order to identify environmental problems in the area, local people should also be examined in addition to natural system indicators.

In this study, the priority in the examination of local people was given to local community which settle in Küçükçekmece Region and live there. On the one hand, these people are affected directly by the adverse effects in natural system in Küçükçekmece Lagoon and basin. On the other hand, they may take role in the formation of these adverse effects by their way of living.

However, the people, who are affected by adverse effects in the Basin or taking role in their formations, are not only the local community settled there. People who come to and spend the day in the Region because of employment are also affected by the adverse changes in the Region. Hence, non-local people may also take part in the formation of changes via their decisions and applications.

In addition to the local community, people, working in the authoritative institutions can take part in the formation of adverse environmental conditions via abusing the environment and ignoring their responsibility.

In the light of this information, local people, effective in the interaction of social system and natural system in Küçükçekmece Region, can be classified as:

- The local community settled and living in the region.
- The people working in the industry and other business facilities in the region. They stay in the region only during working hours.
- The people working in institutions that have authority in environmental protection of the region.

4. METHODOLOGY

The methodology to reach the goals of the study was based on the following criteria described in section 4.1, 4.2 and 4.4.

The method of study consisted of

- 1) A preliminary study to collect general information about the region
- 2) 'Face to face' interviews with a selected sample population
- 3) Questionnaire method based on
 - Open ended questions (OEQ)
 - Closed ended questions (CEQ).

Evaluation of the questionnaire and investigation of the relationships principally based on the results of CEQ by the method of

- Scoring and
- Stepwise and regression by the DATAFIT software.

4.1. Preliminary Study

Initially, interviews were made with the mukhtar of each neighborhood in the basin on the basis of the questions presented in Appendix A.

The questions were about establishment dates of neighborhoods, migrations into the neighborhoods, the factors making attractive the neighborhoods for the people living and working there; livelihood and general socio-economic structure of neighborhood population, environmental pollution and problems in the neighborhoods and services supplied to neighborhoods by governmental institutions. As a result, basic information was obtained on the general characteristics of the neighborhoods, the socio-economic structures and living conditions of the people in Küçükçekmece.

4.2. Determination of Socio-Economic Structure and Environmental Awareness

The following sections describe in detail the methodology for determining the socio-economic structure and environmental awareness of the sample.

4.2.1. Face to Face Interviews

The purpose of this part of study was to communicate with the public to get an insight to their socio-economic structure and environmental awareness.

The questions were prepared on the basis of the goal of the study to cover the concepts such as level of education, reasons of migrations and income level etc. as presented in Appendix B.

Participant selection was such that anyone living and/or working in the basin was eligible. Participants of face to face interviews were selected from two neighborhoods namely as:

- Kanarya and
- Firüzköy

Kanarya is an important neighborhood since it suffers significant problems such as rapid population increase, unplanned urbanization, insufficient infrastructure and the migrations in 1950s and 1990s. With these characteristics, Kanarya was regarded as the neighborhood which has the ability to represent Küçükçekmece at small scale.

Firüzköy is one of the neighborhoods where a high number of industrial facilities exist. One of the most important sources of pollution in Küçükçekmece Basin is industrial facilities and the people in industrial facilities form one part of local population by living and/or working in the basin.

During face to face interviews, 87 people were interviewed in more than four months. While the people interviewed were chosen randomly from people on the streets,

markets and shops in Kanarya; the interviews were limited to people who have a responsibility in industrial facilities in Firüzköy.

Answers coming from public during face to face interviews guided the preparation of the questionnaires based on open-ended questions.

Face to face interview is the first method used in field studies to obtain the required information. The advantages of the method are:

- Direct contact with the subject to lead us prevent misunderstandings
- Readily completion of the task (no detention time)

The disadvantages of the method are:

- Difficulty of finding large number of participants
- Difficulty of getting explicit answers to questions
- Difficulty of limiting the interviews to a fixed time period.

4.2.2. Questionnaire based on Open Ended Questions

It was found that the number of people interviewed on face to face basis was not sufficient for the evaluation of the whole basin. The need for increasing the number of interviewed persons and other disadvantages of ‘face to face’ interviews led to the need for generation of need for an alternative method.

Hence, the questionnaire that is based on ‘open-ended questions’ was chosen as an alternative method because it enabled communication with a large number of people. The questionnaires were given to students in primary and high schools and were targeted to reach the parents.

There were nineteen questions in the questionnaire as listed in Appendix C.

The questions were asked to participants about their socio-economic characteristics such as gender, age, education, occupation, income, homeland; why and when they came to Istanbul; how many years and why they live in Küçükçekmece; environment; environmental pollution; reasons of pollution; parts that are responsible for prevention of pollution; whether they have any personal behavior which is harmful for the environment and their personal opinion about Küçükçekmece Lagoon.

While only the question about the reasons of migration into Istanbul was closed-ended; others were open-ended questions.

1100 people were reached via visiting 33 schools in 75 days.

Answers coming from public during Q-OEQ study guided the preparation of choices in Q-CEQ. The method of Q-OEQ had the advantage of increased number of participants and disadvantages such as no chance of intervening to prevent misunderstandings. In addition to this disadvantage, the problems which were experienced in conversion of answers into numerical form for statistical evaluation of results led to the generation of need for making changes in the form of questions. ‘Closed ended questions’ replaced open ended questions and studies for determination of socio-economic structure and level of environmental awareness of sample population were made with this new method.

4.2.3. Questionnaire based on Closed Ended Questions

Choices of the closed ended questions were prepared on the basis of the answers which were given in the previous methods. There were thirty questions in the questionnaire as presented in Appendix D. 2419 people were reached with this method.

The questionnaire included 28 closed-ended questions about socio-economic characteristics of the participants such as gender, age, education, occupation, income, homeland; why and when they came to Istanbul; how many years and why they live in Küçükçekmece; environment; environmental pollution; reasons of pollution; parts that are responsible for prevention of pollution; their environmental sensitivity and environmental

attitude, their personal opinion about Küçükçekmece Lagoon, their environmental knowledge and the priority of the environment in their lives.

In addition to these questions, two open-ended questions were asked to learn the personal opinion of the participants about reasons of pollution in water resources and consequences of clean water resources consumption.

The method of Q-CEQ had the advantage of transformation of the answers into numerical form thanks to choices. This situation made possible use of scoring and DATA-FIT software programme for the evaluation of results.

4.3. Aims of the Questions used in Q-CEQ

The questions asked in questionnaire based on closed ended questions (Appendix D) to determine the socio-economic situation and environmental awareness of basin population were prepared with the help of the questions used in face to face interviews and questionnaires based on open ended questions and answers given in these two methods. The aims of questions were prepared by considering the questions in the questionnaire based on closed ended questions since the evaluations of answers especially in questionnaire based on closed ended questions were made in this study and the questions used in this method are associated with the questions used in two previous methods as explained above.

The aims of these questions are in the following paragraphs.

One of the aims of this study is to determine the socio-economic structure and environmental awareness of local people in Küçükçekmece Basin. Gender, age, education, occupation and income are main socio-economic indicators. Questions from 2 to 6 have been prepared to determine socio-economic structure of participants in terms of these indicators mentioned above.

The number of home residents (Q 7) was asked to learn how many people have to live with the amount of monthly income which is declared in the previous question. When

the number of home residents increases, the possibility of generation of some troubles in affording the life rises. This situation may affect the environmental concern of the people negatively due to decreasing money per individual. This question was prepared to find out whether there is such a problem in the lives of the participants.

Hometown of residents (Q 8) was asked to learn the local people in Küçükçekmece Region are urban based or rural based because the environmental attitude of the people in cities and rural places may be differentiated from each other as a result of different living conditions according to some studies.

The reasons of residents for coming to İstanbul (Q 9) were asked because it is important to understand the problems or needs in the lives of these people before coming to İstanbul; their priorities and the socio-economic conditions in which they were living before migrated to İstanbul.

With this question, it may become possible to make an evaluation about which one is stronger driving force as reason for coming to İstanbul: the characteristics of the city they leave or the city they come to.

Date when residents in Küçükçekmece Basin come to İstanbul (Q 10), was asked to learn how many years ago local people in Küçükçekmece came to İstanbul. Such an information can be used to understand whether there has been a difference in their living standard after they leave their homeland and whether there has been an effect of the living in a city on their environmental attitude. Besides, with this question, it may become possible to make an evaluation about whether these people come to İstanbul with general migration wave in Turkey.

The number of years in which residents have been living in the Basin (Q 11), was asked to learn the time when local people came particularly to Küçükçekmece Region. These people are not only responsible for the generation of environmental pollution and problems but also affected by the adverse effects of these pollution and problems. In the studies made on the relationship between a place and its inhabitants, there is a term such as '*place attachment*' showing the emotional link of the people to the related place (Jorgensen

and Stedman, 2001). One of the main factors affecting place attachment is the length of residence. This question is important to analyse the possibility of the formation of place attachment for residents in Küçükçekmece Basin. Its existence is important for the generation of the environmental friendly manner in these people especially for the place where they live.

Additionally, Küçükçekmece Basin was accepted as out of basin protection area between 1984-1997. The information coming from such a question is beneficial to control whether there is a relationship between this application and the time when the basin was selected for the settlement by these people. The connection between exclusion from basin protection area and increasing settlement in the Basin is important to find out whether exclusion from basin protection area play a role in increasing pollution and changing social structure based on population raising and unplanned urbanization in Küçükçekmece Region.

The reasons for choosing Küçükçekmece to live (Q 12) is asked to find out the link between the Basin and the residents. This region is a place which has been preferred by the people for more than fifty years. In the initial years of settlement in Küçükçekmece Region, there was no such a huge amount of environmental pollution or serious environmental problem in the basin. This question was prepared in order to understand the differences between the reasons of the people for choosing here in all these years. Additionally, such a question can be important to understand whether the natural beauty of Küçükçekmece Basin especially in previous years and the exclusion of the basin from basin protection area were effective factors in the selection of this region for settlement.

There are 28 neighborhoods in the basin. Their proximity to the Lagoon are different from each other. While some of these neighborhoods are very close to the Küçükçekmece Lagoon, the others are distant from the Lagoon. Contrary to the expectations, the Lagoon is not seen from some of the close neighborhoods while it is seen from some distant neighborhoods. People can follow the changes in a natural resource which they see in their daily life, much more easily. That's why, the location of the neighborhoods and their proximity to the Lagoon is very important to be aware of its environmental situation or not. The neighborhood where the participants live in Küçükçekmece (Q 13) was asked to

determine whether living in a neighborhood in which the Lagoon is easily seen, is effective on their awareness of pollution in Küçükçekmece Lagoon.

The question about the definition of environment (Q 14) was asked to learn both what the word of environment mean for the inhabitants in Küçükçekmece Basin, and the components forming the environment in the minds of these people. By analyzing the answers of the participants to this question, it can be possible to determine whether they have system knowledge based on definition of environment.

Environmental pollution and problems in the neighborhoods (Q 15) were asked to learn whether the residents of the neighborhoods in Küçükçekmece Region are aware of the environmental pollution and problems in their neighborhoods. The answers given to this question can reveal the level of indigenous environmental knowledge which is gained by 5 senses in direct interaction with the environment. This question is also important to determine the general situation in the neighborhoods from environmental point of view.

The selection of the reasons of environmental pollution and problems (Q 16) has been required from the participants by disregarding the environmental conditions in their neighborhoods. With the answers given to this question, it can be understood whether the local people in Küçükçekmece Basin have system knowledge about reasons of the environmental pollution and problems.

Responsible parts to prevent environmental pollution and problems (Q 17) were asked to learn whether the participants have information about the responsibilities of the institutions which have authority in the protection of the environment. By checking the answers given to this question, it may also become possible to have an idea about whether the participants who are residents in Küçükçekmece Basin, regard themselves as one of the parts, responsible for environmental protection.

Participants were required to evaluate their own environmental sensitivity in the following question (Q 18). If the evaluation of this question is made together with total point indicating environmental awareness of participants, the meaningful and acceptable results can be obtained.

The interviewees were required to express their views as ‘regret, no regret and never’ about the behaviors which can cause environmental pollution and problems (Q 19). The views about the behaviors given in the question, can be useful to analyze *the environmental attitude* of local people in Küçükçekmece Region.

Küçükçekmece Lagoon is under a heavy pollution load today. With the question asking current pollution state in the Lagoon (Q 20), it has been aimed to learn whether the inhabitants of the Basin are aware of the problem of pollution in the Lagoon and whether they have *indigenous environmental knowledge about this subject*. This question is also important to understand how much they are interested in Küçükçekmece Lagoon which is a very important natural resource in their region as one of the small number of natural lagoons in the world.

Opinions of residents about swimming and eating the fish caught in Küçükçekmece Lagoon (Q 21 and Q 22) were asked to learn the opinions of the local people about some activities in the Lagoon whose pollution can negatively affect the health of the human beings during the activity. With the answers given to this question, it can be understood whether the participants are really aware of seriousness of current state of pollution in Küçükçekmece Lagoon and its probable adverse impacts on human beings.

The types of the benefits, expected from Küçükçekmece Lagoon, by the residents in the Basin (Q 23) were asked to find out whether the local people are aware of the variety of services which can be supplied by Küçükçekmece Lagoon as a water body.

Determination of environmental knowledges as true or false (Q 24) was required from the participants to understand whether they have a certain level of *system knowledge based on informations about general environmental problems and how ecosystem operates*.

The results of the consumption of clean water resources (Q 25) and the reasons of pollution in the natural water resources (Q 26) are related to the natural processes in the ecosystem. That’s why, these questions were also asked to determine *system knowledge* of participators.

Questions about institutions, responsible for collection of garbages (Q 27), construction of sewage systems (Q 28) and inspection of industrial facilities (Q 29), were asked to learn whether the participators have knowledge about responsibilities of the institutions which are authorized in the protection of environment and prevention of environmental pollution.

The preference of participants about spending extra money they have for environment (Q 30) was asked to determine the place of environment in *priorities* of people by the help of the explanations about what the participants make expenditure for and why they do not spend money for the environment.

4.3.1. Suggestions for the Form of Questions

During the evaluations of the questionnaires, it was realised that asking some of the questions in a different way could make questions much more understandable and increase the reliability of answers. Suggestions for modification of the questions are explained in the following:

There is a high number of housewife participants who has no specific income. These women answered the question related to montly income (Q 6) by considering total amount of money input in the family. However, questionnaire study was made to exhibit the current income of the individuals not that of a family. Hence, the question could have been asked as ‘What is your personal monthly income?’ to depict the relation between individual socio-economic status of participants and their environmental awareness.

Some of the participants responded the question about reasons for coming to İstanbul (Q9) by considering the reasons of their parents for migrating into İstanbul. This question could have been asked as ‘What is your personal reason for coming to İstanbul?’ to prevent such a confusion during responding the question.

Some participants have chosen more than one choice to answer the questions about reasons for coming to İstanbul (Q9) and reasons for choosing Küçükçekmece to live (Q12). As such, some confusion was raised in evaluation of the questionnaire. To improve the

quality of evaluation of these questions, the questions should be given with the restriction such as ‘Choose only one of the answers’.

4.4. Methods Used in the Evaluation of the Results of the Q-CEQ

Socio economic structure and environmental awareness of people were determined on the basis of the answers given in the questionnaires. Some results were evaluated as distribution.

With this method, the socio-economic structure of the basin population was determined through the answers, given to the first 13 questions. The answers of the questions from 14 to 30 were used to determine the environmental awareness, knowledge and priorities of the same people.

For the determination of the relationship between socio-economic structure and environmental awareness of people, statistical methods were used. Each choice in the questions were converted to numerical value to apply the statistical package.

4.4.1. Scoring

As mentioned above, a number was assigned to each choice in questions 14-30, which were asked to determine environmental awareness, knowledge and priorities of the basin population. In this method, total score that is obtained on the basis of the selected choices in each question demonstrates the level of environmental awareness of each participant. The points which were given to each choice are presented in Appendix E.

4.4.2. Regression and Stepwise Method in the ‘Data Fit’ Software

Multiple regression analysis was made to depict the degree of impact of the independent variables, indicating socio-economic structures, system knowledge, indigenous environmental knowledge and environmental attitude on variable Y that denotes the level of environmental awareness of participants in this study.

According to literature, 'regression analysis concerns the study of relationships between variables with the object of identifying, estimating, and validating the relationship. The estimated relationship can then be used to predict one variable from the value of the other variables (Johnson and Bhattacharyya, 1996).

Data Fit includes Forward Selection, Backward Elimination, Stepwise Selection and Manual Variable Selection modes to help determine which independent variables should be included in your regression model. These features include checks to help identify multicollinearity between predictor variables.

In this study, stepwise method was used to show the relation between variables and effect of system knowledge indigenous environmental knowledge and environmental attitude on environmental awareness level of participants.

5. RESULTS AND DISCUSSION

The first part of this chapter includes general information about socio-economic situation and environmental awareness of basin population based on a wide variety of indicators such as education, age, income, system knowledge or indigenous environmental knowledge. The relationships between these variables and their specific contribution to the level of environmental awareness of basin population have been given in the second part.

In the field study,

- 87 people were interviewed on 'face-to-face' base,
- 1100 people were given questionnaire based on open ended questions,
- 2419 people were given questionnaire based on closed ended questions.

The problems experienced in face-to-face interviews and Q-OEQ led to development of Q-CEQ as the core method used for determination of socio-economic status and environmental awareness of the people.

5.1. Results of the Questionnaires with Closed Ended Questions

The answers of 2419 participants were evaluated on the following:

Their

- Socio-economic status
- Dates and reasons of migration into and settlement in Küçükçekmece and Istanbul
- Neighborhoods
- Environmental knowledge about definition of the environment, environmental pollution and problems, their reasons and the parts that are responsible for their prevention
- Environmental sensitivity
- Opinions about Küçükçekmece Lagoon and the ways benefiting from the Lagoon

- Opinions and attitudes about reasons of pollution in water resources and results of the consumption of clean water resources
- Knowledge about duty area of institutions that are responsible for environmental protection and prevention of pollution.

There are 28 neighborhoods in Küçükçekmece Basin and 2419 people were reached by going to each of the neighborhoods. While some neighborhoods were the places where wastewaters were flowing among the houses in streets, masses of garbages were left, inhabitants were living in poor living conditions and forming groups among themselves according to cities from which they were migrating; the others were the neighborhoods where more planned settlement was seen and inhabitants were living in harmony with each other at higher living standards than the people in the neighborhoods mentioned previously.

It became possible to see the patterns of different life styles in Küçükçekmece Basin in the study by reaching these 2419 people who were living in the neighborhoods that had the characteristics mentioned above.

When the number of the people which have been reached through the method of questionnaire used in the studies about socio-economic structures and environmental awareness of the public in different countries of the world (Fath and Beck, 2005; Özdemir et al., 2004), are checked, it is clearly seen that the number of the people, 2419, reached in this study is a highly satisfying number to obtain acceptable results at the end of the study.

In some of the questions below, total number of answers is bigger than 2419 since some of the participants chosed more than only one choice.

5.1.1. Socio-Economic Profile of Basin Population

The distribution of the participants in terms of gender is given in Table 5.1. These results show that distribution of male participants (55.9 %) is higher than that of female participants (43.3 %).

Table 5.1. Distribution of gender among participants

GENDER	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) Female	1048	43.3 %
b) Male	1352	55.9 %
Blank	19	0.8 %
Total	2419	100 %

The age profile of participants is given in Table 5.2. The values show that maximum distribution lies within the age group 30-50 (86.6 %).

Table 5.2. Distribution of age among participants

AGE	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) 20 and below	38	1.6 %
b) Between 21-30	165	6.9 %
c) Between 31-40	1299	53.7 %
d) Between 41-50	798	32.9 %
e) Between 51-60	95	3.9 %
f) 61 and above	16	0.7 %
Blank	8	0.3 %
Total	2419	100 %

The division of participants according to their education levels is given in Table 5.3. These results show that a low ratio of participants (2.9 %) is illiterate. However, totally 30.4 % of the participants has high school (21.9 %) or university (8.5 %) education. The majority of the participants is out of these groups with 66 % and they have primary or secondary school education.

Table 5.3. Education level among participants

EDUCATION LEVEL	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) Illiterate	70	2.9%
b) Primary school graduate	1199	49.6%
c) Secondary school graduate	398	16.4%
d) High school graduate	531	21.9%
e) University graduate	207	8.5%
Blank	14	0.5%
Total	2419	100%

The division of participants on the basis of income level is in Table 5.4 below. According to these results, only 18 % of participants makes money more than 1000 TL per month. 26.4 % and 52.8 % of the rest of the participants declared their income level as between ‘minimum wage and below’ and ‘minimum wage and 1000’, respectively.

Table 5.4. Income level among participants

INCOME LEVEL	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) None	357	14.7%
b) Minimum wage or below	283	11.7%
c) Between minimum wage and 700 TL	624	25.8%
d) Between 700 – 1000 TL	654	27.0%
e) Between 1000 – 2000 TL	332	13.7%
f) Above 2000 TL	105	4.3%
Blank	64	2.7%
Total	2419	100%

Participants can be grouped as indicated in Table 5.5 according to total number of people in their house.

Table 5.5. Number of home residents

NUMBER OF HOME RESIDENTS	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) 2 or less	21	0.8%
b) 3 – 4	1272	52.5%
c) 5 – 10	1086	44.9%
d) More than 10	30	1.2%
Blank	10	0.4%
Total	2419	100%

These results show that nearly all of the participants (97.4 %) live within a home population consisting of 3 – 4 people (52.5 %) or 5 – 10 people (44.9 %). There is approximately no one sharing his/her home with only 1 person or more than 10 people within the participants.

The distribution of participants according to regions which include their homelands are shown in Table 5.6.

Table 5.6. Homeland distribution among participants

HOMELAND	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) Black Sea Region	787	32.5%
b) East Anatolia Region	522	21.6%
c) Marmara Region	408	16.9%
d) Middle Anatolia Region	265	10.9%
e) South East Anatolia Region	143	5.9%
f) Abroad	80	3.3%
g) Mediterranean Region	54	2.2%
h) Aegean Region	44	1.9%
Blank	116	4.8%
Total	2419	100%

As it is seen above, Küçükçekmece Region is a place under the effect of migration from different cities in each Region of Turkey. Black Sea, East Anatolia and Marmara are the regions whose social, economic and cultural structures are highly different from each other. However, majority of the participants or their families have migrated from these regions into Küçükçekmece. This situation is one of the most important indicators of cosmopolitan population in the Basin.

The results about socio-economic status of the participants in terms of socio-economic indicators such as gender, age, education, the number of home residents and homelands demonstrate with a more general approach that

- The populations of male and female, forming basin population, are not different from each other very much numerically
- Major part of the basin population consists of middle-aged people
- Basin population has low level of education and income although it seems literate

- Basin population has a cosmopolitan structure due to migrations from each region of Turkey.

5.1.2. Settlement in Küçükçekmece and Istanbul

When participant's reasons of migration into Istanbul are examined, the result shown in Table 5.7 were reached.

Table 5.7. Participant's reasons of migration into Istanbul

REASONS OF MIGRATION	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) Born in Istanbul	517	20.7%
b) Terror	20	0.8%
c) Unemployment	888	35.5%
d) The existence of relatives in Istanbul	295	11.8%
e) Due to business of wife or husband	390	15.6%
f) Reducing share of land due to number of brothers	91	3.6%
g) Due to appointment	133	5.3%
h) Other (Please write down <input type="checkbox"/>	146	5.9%
Blanks	18	0.8%
Total	2498	100%

According to these result, 20.7 % of participants was born in Istanbul. 35.5 % of the rest of the participants migrated into Istanbul due to unemployment. The other two main reasons of migration into Istanbul are business of wife or husband (15.6 %) and the existence of relatives in Istanbul (11.8 %). In addition to them, appointment, reducing share of land due to high number of brothers and terror were expressed as the factors, effective in the migrations into Istanbul eventhough their ratios are very low.

The dates when participants came to Istanbul are shown in Table 5.8. These results show that while 19.2 % of participants was born in Istanbul, the rest of them consists of the people who migrated into Istanbul at different dates.

According to answers, 19.47 % of participants came to Istanbul before 1980s (4.9 % between 1950 – 1970; 14.5 % between 1971 – 1980). The people who came to Istanbul

after 1980, forms 60.1 % of participants. From these participants, 25.5 % came to Istanbul between 1981 – 1990 while 34.6 % after 1991.

Table 5.8. Dates when participants came to Istanbul

TIME INTO ISTANBUL	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) Born in Istanbul	468	19.2%
b) Between 1950-70	120	4.9%
c) Between 1971-75	178	7.3%
d) Between 1976-80	175	7.2%
e) Between 1981-85	256	10.6%
f) Between 1986-90	361	14.9%
g) Between 1991-95	389	16.0%
h) Between 1996-2000	286	11.7%
i) 2001 and after	167	6.9%
Blanks	30	1.3%
Total	2430	100%

The division of participants according to answers, given to the question ‘How many years have the participants been living in Küçükçekmece Basin?’ are grouped according to three time periods such as less than 10 years, from 10 to 20 years and more than 20 years.

The results are provided in Table 5.9.

Table 5.9. Number of years participants have been living in Küçükçekmece Basin

YEARS	NUMBER OF PARTICIPANTS	DISTRIBUTION
<10	649	26.8 %
$10 \leq \text{Number of years} \leq 20$	945	39.0 %
Number of years > 20	523	21.7 %
Blank	302	12.5%
Total	2419	100%

In accordance with these ratios, approximately 39 % of participants have been living in the Region for the periods, changing, from 10 to 20 years. This group is followed by the 26.8 % and 21.7 % of participants who have been living in the Region for less than 10 years and more than 20 years, respectively.

The reasons of participants for selecting Küçükçekmece Region to live indicated in Table 5.10. These results show that the main reason of the people to live in Küçükçekmece is the existence of relatives and/or friends in the Region with 42.4 %. It is followed by the reasons such as business opportunities (21.0 %) and cheap houses and lands (9.6 %) in the Region.

Table 5.10. Reasons why participants selected Küçükçekmece Region to live

REASON LIVE IN KUCUKCEKMECE REGION	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) Existence of relatives, friends ...etc.	1066	42.4%
b) Due to natural beauties (existence of Lagoon, beauty of nature)	134	5.3%
c) Business opportunity, existence of industry	530	21.0%
d)Existence of suitable conditions which make easier const. of buildings	27	1.0%
e) Living like in hometown	27	1.0%
f) Cheap houses and lands	242	9.6%
g) Due to house provided by the business place	57	2.3%
h) Other (Please write down.....)	229	9.1%
ı) House in Küçükçekmece	103	4.1%
Blank	99	3.9%
Total	2514	100%

Although other reasons are also effective in selection of Küçükçekmece Basin such as ‘natural beauties’, ‘existence of suitable conditions which make easier construction of buildings’ or ‘houses in the Region provided by the business place’, the ratios of these causes are highly low.

As a result, when the reasons and dates of coming to Istanbul and Küçükçekmece are analyzed together it is seen that while the reasons of coming to Istanbul are especially based on unemployment in the cities from where people come, the factors related to marriage and existence of relatives in Istanbul; the reasons of coming to Küçükçekmece are also based on cheap houses and lands in the Region in addition to the factors that are also effective in migrations to Istanbul such as business opportunities and relatives in Küçükçekmece.

While the 60 % of the inhabitants have migrated into Istanbul after 1980, 65.86 % of the inhabitants consists of the people who have lived in Küçükçekmece since 1988. 21.63 % is the ratio of the people who have been living in the Region more than 20 years.

As it is known, Küçükçekmece Basin was kept out of basin protection between 1984 - 1997. The dates mentioned in the previous paragraph show that the settlement in the Region was especially increased in these dates. These results are important to see the impacts of keeping the basin out of protection area on the social and environmental changes in the Region.

5.1.3. Environmental Knowledge

The approaches of participants to *definition of environment* are shown in Table 5.11.

Table 5.11. Approaches of participants to definition of environment

APPROACH OF PARTICIPANT	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) Neighbors, friends, family, people in surroundings	1199	49.6%
d) The place where all living such as people, animal, Plants & nonliving elements exist and interact each other	702	29%
c) Nature	241	10%
b) Residential area, neighborhood, land	199	8.2%
Blank	78	3.2%
Total	2419	100%

50 % of participants defined environment as the people, consist of family, friends or neighbors. It is choice (a) and the most distant answer to the correct definition of environment when compared to other choices.

The ratio of the participants who chose (d) in which the definition of environment was given in the most correct form as ‘The place where all living such as people, animal, plants and nonliving elements exist and interact each other’ is a little bit more than half of the ratio of the people who chose (a). The ratios of other choices are noticeable lesser than the percentages of these two choices.

The difference between the percentages of the people who chose (a) defining environment incorrectly and (b) defining environment in the most correct form within all choices shows how the definition of environment in the mind of the people is different from the accurate definition of environment.

The ratios of the answers given to the question about environmental pollution and problems in the neighborhoods are provided in Table 5.12.

Table 5.12. Answers regarding environmental pollution and problems in the neighborhoods

ANSWER	NUMBER OF PARTICIPANTS	DISTRIBUTION
g) Garbage (Solid waste)	1160	21.7%
c) Noise pollution	1074	20.1%
e) Visual pollution	986	18.4%
a) Air pollution	865	16.1%
d) Odor	577	10.8%
b) Waste waters	447	8.4%
f) Nuclear wastes	86	1.6%
Blank	148	2.7%
Total	5343	100%

According to the answers of the participants, pollutions, perceived by 5 senses such as garbage (by seeing and smelling), noise (by hearing), visual (by seeing) and odor (by smelling) have ratios such as 21.7 / 20.1 / 18.4 and 10.8, respectively. Such a pollution group which is perceived by 5 senses has the greatest share with 71% within all pollution types in the neighborhoods.

This group is followed by another pollution group, including waste water (8.4 %) and air pollution (16.1 %) which are the indicators of negative impacts of industrial facilities in the Region, with 24.5 %.

As the last pollution type, possible nuclear wastes from Nuclear Research Center in the Region was determined as another pollution type in the neighborhoods with 1.6 %.

According to participants, the reasons of environmental pollution and problems are as shown in Table 5.13.

Table 5.13. Reasons of environmental pollution and problems according to participants

REASON STATED	NUMBER OF PARTICIPANTS	DISTRIBUTION
c) Insufficient infrastructure	1042	19.3 %
a) Factory/industry	1021	18.9 %
e) Misuse of nature	922	17.0 %
d) Unplanned urbanization	874	16.2 %
b) Traffic	706	13.0 %
g) Misuse of natural resources	531	9.8 %
f) Global effects	217	4.0 %
Blank	84	1.6 %
Total	5397	100 %

From the answers given to question 16, asking reasons of environmental pollution and problems, ‘insufficient infrastructure (19.3%) and factory and industry (18.9 %)’ and ‘misuse of natural resources (17.0%) and unplanned urbanization (16.2%)’, give an idea about environmental awareness and environmental consciousness of participants, respectively.

The total ratio of these first four answers whose ratios are not different from each other very much is 71.4 % and these answers show the main reasons of environmental pollution and problems according to participants.

The participants had chosen the choices which denote the similarity with the problems in the neighborhoods where they live, as the reasons of environmental pollution and problems. Such a way of responding shows that people can make decision under the effect of their own life conditions in the evaluations made for environmental topics.

The parts that are responsible for prevention of environmental pollution and problems are given in Table 5.14.

According to the participants, the main responsibility for prevention of environmental pollution and problems belongs to ‘municipality’. ‘People’ is in the second place after municipality. Such a rank of answers shows that in the opinions of participants, people should also play an effective role in the protection of environment as much as the governmental institutions which have responsibilities on that area.

Table 5.14. Parts held responsible for prevention of environmental pollution and problems by participants

PART	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) Municipality	1576	31.9 %
d) People	1427	28.9 %
c) Ministry of Environment and Forestry	1181	23.9 %
f) Educators	282	5.7 %
b) IWSA	273	5.5 %
e) Media	138	2.8 %
Blank	63	1.3 %
Total	4940	100 %

It was seen at the end of the study that the meaning of the term of ‘environment’ is ‘neighbors, friends, family, people in surroundings’ for most of the people living in the Basin. The real definition of environment from environmental point of view such as ‘the place where all living such as people, animal, plants and nonliving elements exist and interact each other’ is another definition of environment which is preferred by basin population in spite of not as much as the first one. The definition of environment on the basis of ‘nature’ or ‘residential area’ is not very meaningful for basin population. The preferences, made in definition of environment, are important to understand the level of knowledge of basin population about this subject.

The most significant reason of deterioration in environmental quality in the Region is the uncontrolled discharge of domestic and industrial wastewaters into the Lagoon and the Basin without any treatment according to the field studies made in the Küçükçekmece Basin. There is no sufficient infrastructure which can meet all needs, in the Basin (Üstün et al., 2008). It was clearly seen in field studies that the construction of sewage channels in some neighborhoods is made by the inhabitants themselves. Additionally, it was determined the rise in the value of e-coli during monitoring studies, made at 13 points in the Lagoon. This result is another clear indicator of the discharges of the wastewaters into the Lagoon (Üstün et al., 2008). In spite of all these results, showing wastewater problem in the Basin, ‘wastewater’ is not a problem that has priority for the people in the Basin according to studies, made through questionnaires.

The environmental pollution and problems, disturbing the local people in the Basin, mostly consist of the environmental problems whose adverse impacts can be perceived by 5 senses such as ‘noise, odor, garbage’.

Additionally, the existence of participants who chose nuclear wastes is an interesting situation although their ratio has the lowest value with 1.6 % when compared to others. Such an answer shows that basin population has a serious suspicion about this subject.

The lack of a certain information about existence of nuclear wastes in the Basin in spite of the Nuclear Research Center and suspicions of the people about this matter shows the deficiency of a detailed study about whether there is a danger due to nuclear wastes.

Although wastewater problem had not priority for basin population, insufficiency of infrastructure was determined as main reason of environmental pollution and problems. This was followed by factories, misapplications in the use of natural environment, and unplanned urbanization. Such answers which were given as the reasons of environmental pollution with a general approach are actually another expression of the factors that were given as the causes of pollution in Küçükçekmece Basin such as uncontrolled industrialization and unplanned urbanization.

The main part that is responsible for prevention of environmental pollution and problems was ‘municipality’ for basin population. ‘People’ and ‘Ministry of Environment and Forest’ were the other parts, regarded as responsible in this area. Accepting the ‘people’ as one of the main parts that are responsible for prevention of environmental pollution besides institutions, can be regarded as the indicator of the people who put themselves in the parts responsible for prevention of the environmental pollution, within basin population.

The determination of ‘people’ as the main parts, responsible for prevention of pollution reminds the characteristics of people who are named, in Value Basis Theory, as Biocentric which consider all living organisms before any decision or behavior (Schultz, 2001). According to this approach, humans should not harm nature because they are a part

of nature; species have a right to continue; nature has intrinsic rights broader than mere species survival.

Acceptance of basin population as one of the parts that is responsible for prevention of pollution by themselves can be a sign of presence of biocentric people in the Basin. Such a situation can be very useful to gain public support for public participation whose application in the Basin is suggested for next days.

5.1.4. Environmental Sensitivity of Basin Population

The results of evaluation made about environmental sensitivity of participators by themselves are provided in Table 5.15.

Table 5.15. Self-evaluation of participants regarding environmental sensitivity

ENVIRONMENTAL SENSITIVITY	NUMBER OF PARTICIPANTS	DISTRIBUTION
b) Sensitive	1216	49.8%
a) Very sensitive	667	27.4%
c) From time to time	444	18.1%
d) None	71	2.9%
Blank	44	1.8%
Total	2442	100%

According to these ratios, 77.2 % of the participants defined themselves as sensitive (27.4 % very sensitive, 49.8 % sensitive) from environmental point of view.

Closeness of the ratios, pertaining to the people who define themselves as very sensitive (27.4 %) in question 18 and the people who express the personal responsibility of the people in the prevention of environmental pollution and problems by selecting the answer of 'people' in question 17 (28.9 %), is important since it shows the parallel viewpoints among the participants.

5.1.5. Opinions About Küçükçekmece Lagoon and the Ways for Benefiting from the Lagoon

The opinions of participants about current state of pollution in Küçükçekmece Lagoon are given in Table 5.16.

Table 5.16. Opinions of participants about current state of pollution in Küçükçekmece Lagoon

STATE OF POLLUTION IN KÜÇÜKÇEKMECE LAGOON	NUMBER OF PARTICIPANTS	DISTRIBUTION
a) Polluted day by day	1285	53.0%
c) No idea	709	29.3%
b) Clean	170	7.0%
d) Disinterested	141	5.9%
Blank	114	4.7%
Total	2423	100%

The pollution in Küçükçekmece Lagoon has been increasing day by day according to 53 % of the participants. This situation shows that the people who have an idea about the Lagoon since they live in the basin, are able to make correct evaluations about current state of pollution in the Lagoon.

The total ratio of the people who accept that the pollution in the Lagoon has been increasing day by day (53%) and the Lagoon is clean (7.0 %) is 60 %. This ratio is significant to show the amount of the people who are interested in the current situation of the Lagoon in terms of pollution although the opinion of ‘clean Lagoon’ is a wrong evaluation.

However, an important part of the participants with nearly 30 % told that they have no idea about the Lagoon. Such a result makes questionable whether the existence of the Lagoon is important for these people living in the Basin before its current situation. The determination of the factors which cause the formation of such a situation can be important to make a more detailed evaluation.

The preferences about swimming in the Lagoon and eating the fish caught in the Lagoon are as indicated in Table 5.17 and Table 5.18 respectively.

Table 5.17. Preferences about swimming in the Lagoon

PREFERENCE	NUMBER OF PARTICIPANTS	DISTRIBUTION
b) No	2129	88.0%
a) Yes	215	8.9%
Blank	75	3.1%
Total	2419	100%

Table 5.18. Preferences about eating the fish caught in the Lagoon

PREFERENCE	NUMBER OF PARTICIPANTS	DISTRIBUTION
b) No	2345	96.9%
a) Yes	31	1.3%
Blanks	43	1.7%
Total	2419	100%

The ratios given above show that approximately 90 % of the participants do not prefer to swim in the Lagoon or to eat the fish caught in the Lagoon.

The height of this ratio demonstrates that the people who are more than 53 % of the participants, seen in the answers of question 20, are aware of the pollution in the Lagoon. These people want to protect themselves against health problems without swimming in the Lagoon or eating the fish caught in the Lagoon.

The comparison of these ratios indicates that the people can behave in ego-centric approach to environment in order to protect their health.

The preferences of participants about benefiting from the Lagoon are as indicated in Table 5.19.

‘Use surrounding of the Lagoon for social purposes’ is the first way for approximately 50 % of the participants to benefit from the Lagoon. Use of the Lagoon as a water resource for drinking, swimming or sport activities are other ways to benefit from it and their ratios are highly less than 50 %.

Table 5.19. Preferences of participants about benefiting from the Lagoon

PREFERENCE	NUMBER OF PARTICIPANTS	DISTRIBUTION
d) Use surrounding of the Lagoon for social purposes (picnic, walking... etc)	1181	48,8 %
e) Use as drinking water	450	18.6%
c) Water sports (sailing, surfing)	259	10.7%
b) Swimming	248	10.3%
a) Fishing	204	8.4%
Blank	77	3.2%
Total	2419	100%

These results show that the importance of the Lagoon as a water resource and the advantages based on its existence in the Region are not known by Basin population sufficiently.

5.1.6. Knowledge About Environmental Protection and Prevention of Pollution

According to participants, the institutions responsible for construction of sewage system and taking away waste water are given in Table 5.20.

Table 5.20. Institutions held responsible for construction of sewage system and taking away waste water by participants

INSTITUTION	NUMBER OF PARTICIPANTS	DISTRIBUTION
(b) IWSA	1678	69.4%
(c) Municipality	581	24.0%
(d) Min. of Env	86	3.5%
(a) Village headman	12	0.5%
(e) Others	7	0.3%
Blanks	55	2.3%
Total	2419	100%

Nearly 70 % of the participants responded question 27 correctly with the selection of 'IWSA' as the institution, responsible for construction of sewage system and taking away waste water.

According to participants, the institutions responsible for collecting garbage are provided in Table 5.21. More than 80 % of the participants chose ‘municipality’ as the institution, responsible for collection of garbage and responded the question correctly.

Table 5.21. Institutions held responsible for collecting garbage

INSTITUTION	NUMBER OF PARTICIPANTS	DISTRIBUTION
(c) Municipality	1998	82.6%
(d) Min. of Env	333	13.8%
(e) Others	14	0.6%
(a) Village headman	9	0.4%
(b) IWSA	6	0.2%
Blanks	59	2.4%
Total	2419	100 %

According to participants, the institutions responsible for inspection of industrial facilities are presented in Table 5.22.

Table 5.22. Institutions responsible for inspection of industrial facilities

INSTITUTION	NUMBER OF PARTICIPANTS	DISTRIBUTION
(d) Min. of Env	1270	52.5%
(c) Municipality	766	31.7%
(a) Village headman	100	4.1%
(b) IWSA	54	2.2%
(e) Others	32	1.3%
2,3,4	91	3.8%
Blanks	105	4.5%
Total	2419	100%

‘Ministry of Environment and Forestry’ and ‘Municipality’ are the main authorities which were chosen with 52.5 % and 31.7 %, respectively, as the institutions, responsible for inspection of environmental impacts of industrial facilities. While the ratio of the answer which includes three institutions such as Ministry of Environment and Forestry, Municipality and IWSA (İstanbul Water and Sewerage Administration) is only 3.8 % although IWSA is the other institution that have responsibility in this field, ‘village headmen’ was chosen by 4.1 % of participants.

The interaction between basin population and people in charge in the institutions which have responsibility in the environmental protection of the Region shows the form of relationship between two of the groups forming local people in the Basin. If the basin population has information about responsibility field of the institutions in terms of environmental problems, they can apply right people and institutions for their solution. If the people, in charge in the related institutions, are aware of their own authority and responsibilities for environmental protection, they can play role in the formation of healthier conditions for lives of basin population and can prevent the generation of worse environmental conditions by carrying out their responsibilities.

A large part of the people, living in the Basin, knows that the institutions which are responsible for construction of sewage system and collection of garbages are IWSA and municipality, respectively. The selection of only Ministry or only municipality as the institution, responsible for inspection of environmental impacts of industrial facilities by a lot of people shows that basin population has also information about responsibilities of the institutions about this area. However, selection of village headman as an institution that has responsibility in this field or selection of Ministry, IWSA and municipality together by only minor amount of people is a sign of the existence of the people who have wrong or insufficient information. Smallness of the amount of the people, choosing IWSA, can be based on both the insufficiency of the information of the people about responsibilities of IWSA and deficiencies, seen in the way of working applied by IWSA.

5.1.7. Opinions and Attitudes about Water Resources

The opinions about results of consumption of clean water resources are given in Table 5.23.

Question 25 which is about results of consumption of water resources is a open-ended question as a different form from previous questions. It is expected from participators to respond the question on the basis of their own opinions and informations about this subject. When the answers were grouped and their ratios were calculated, the first three answers were determined as ‘aridity’, ‘health problems’ and ‘starvation’ as mentioned above in more detailed form. Besides them, some social, economic and

environmental results of consumption of water resources were also given by participants such as ‘wars for water, decreasing agricultural production or extinction of some species’.

Table 5.23. Output of CEQ on clean water consumption

CONSEQUENCE OF CLEAN WATER CONSUMPTION	NUMBER OF PARTICIPANTS	DISTRIBUTION
Aridity	986	29.4%
Health problems	562	16.8%
Starvation, end of living organisms	402	11.9%
Environmental pollution	304	9.0%
Extinction of some species & deterioration in naturak balance	103	3.0%
Economic troubles	45	1.4%
Decreasing agricultural production	41	1.3%
Wars for water	39	1.1%
Migrations	20	0.6%
Treatment of sea waters	16	0.5%
Chaos	13	0.3%
Lack of electricity and energy	8	0.2%
Dependency on foreign countries and external resources	5	0.2%
Exploration of different water resources	5	0.1%
Polluted seas	1	0.0%
Invalid answers	286	8.5%
Blank	524	15.6%
Total	3360	100%

The first answers that were given to this question and their ratios clearly show that what basin population regard as results of consumption of water resources are common problems which are capable of affecting all living organisms, human being, animal or plant. The first three answers, aridity, ‘health problems’ and ‘starvation’, are different from the others because not only they have higher shares than the other answers but also they can be accepted as the indicators of effects of this situation which are seen directly and in a shorter time period than the others.

Although the other answers such as deterioration in natural balance, decreasing agricultural production, migrations and dependency on foreign countries affect to each other, they are different from the first three answers because they seem in separate fields of life and their impacts are seen in human life much more indirectly and in a longer time period.

Another noticeable situation in answers given to this question, is the magnitude of total amount of blank and invalid answers. The total ratio of questionnaires in which such type of responding were is 24.1 % (8.5 % invalid, 15.6 % blank). This ratio is very high when it is compared to the amount of the blank answers in closed ended questions. Possible reasons for this are the following:

- Incomprehensibility of the question for some of the participants,
- Difficulty of responding the question with the participator's own words and expressions, and
- A feeling of tiredness in responding question at the end of the questionnaire.

Opinions of participants about reasons of pollution in water resources are provided in Table 5.24.

Table 5.24. Output of CEQ on water resource pollution

REASONS OF WATER RESOURCE POLLUTION	NUMBER OF PARTICIPANTS	DISTRIBUTION
Wastes that are discharged into water bodies without treatment	1277	42.9%
People & illiteracy	379	12.8%
Insensitivity of people	271	9.1%
Unconsciousness of people	127	4.3%
Unplanned urbanization, insufficient infrastructure	132	4.4%
Uncontrolled water use	85	2.9%
Irresponsibility of authorities	58	1.9%
Lack of protection	19	0.7%
Lack of inspection	19	0.7%
Climatic factors	12	0.4%
Intervention to natural systems (water capture and depositing)	5	0.1%
Inappropriate planning in land use	4	0.1%
Nuclear energy (wastes)	3	0.1%
Flood & soil sliding	2	0.0%
Invalid answers	48	1.6%
Blank	535	18.0%
Total	2976	100%

This question asking the reasons of pollution in natural water resources is the second and last open ended question of the questionnaire. Nearly half of the participants (42.9%)

defined 'all wastes that are discharged into water bodies without any treatment' as the main reason of pollution in the natural water bodies. It was followed by the answers such as 'people & illiteracy' and 'insensitivity of people' although their ratios are very low according to the first one as it is seen above. In addition to these first three answers, the answers, based on lack of city life in which the necessary plans and their implementation are made on the right time for environmental protection, such as unplanned urbanization, insufficient infrastructure and lack of inspection were also given as reasons of pollution in water resources.

As it is seen above, the answers of this question can be expressed into 14 different groups. The main factors, playing role in the formation of answers of basin population to this question, can be determined as given below when some of the groups of answers are evaluated together:

The answers, forming three different groups such as 'people & illiteracy', 'insensitivity of people & their insensitive behaviours', and 'unconsciousness of people', draw attention to the factor of human being with total ratio of 26.2 % within answers given to this question.

The answers, forming other groups such as 'intervention in natural system', 'inappropriate planning in land use', 'unplanned urbanization, insufficient infrastructure', and 'lack of protection', show the share of answers related to misuse of institutional responsibilities with the ratio of 5.3 %.

Although the answers such as 'irresponsibility of authorities' and 'lack of inspection' have low ratio with 2.6 %, they are important since they include the answers indicating irresponsibility of institutions which are responsible for protection of water resources.

The answers such as 'all wastes (waste water, solid waste) discharged without any treatment' and 'uncontrolled use of water' are also important with high ratio of 45.8 % because they show the share of water users in pollution of water resources.

In addition to the factors given above, 'climatic factors' and 'flood & soil sliding' are other two pollution reasons which can be evaluated together although their total ratio is very low with 0.4 %.

In this question, the total share of invalid answers and blank answers is 19.6 % (1.6 % invalid, 18.0 % blank). This ratio shows the amount of questionnaires which are evaluated without this question. The explanations that are made as the reason of invalid and blank answers in question 25 can also be accepted true for this question.

Because the total ratio of invalid and blank answers is 19.6 %, 80 % of basin population can be regarded as sufficiently conscious for making correct evaluations about pollution reasons of natural water bodies. Besides that, indication of wastes, discharged into water bodies without treatment, by 43 % of these people is important since it demonstrates the environmental knowledge of basin population in this field.

Relationship between knowledge about definition of environment and priorities of human beings are provided in Table 5.25.

The aim of investigating the relationship between 'Definition of Environment' (Q14) and 'Spending Extra Money for Environment' (Q30) is to understand whether the people who represented a high level of environmental knowledge by choosing the choice defining environment with suitable expressions, are have positive attitude towards environment as given in Table 5.25.

As it was mentioned before, the least expected answer for definition of environment in question 14 is choice (a) since the correctness of the choices in terms of definition of environment increases from choice (a) to choice (d). According to the relationship between questions 14 and 30, the ratio of the people who accept to spend extra money they have for environmental issues, is increasing from people choosing (a) to choosing (d) for definition of environment.

Table 5.25. Relationship between definition of environment and preference about spending extra money for environment

Question 30	a) Yes	b) No	Blanks
Question 14			
Neighbors, friends, family, people...	736 61.3 %	357 29.7%	106 8.8%
Residential area, neighborhood, land	118 59.2 %	57 28.6 %	24 12.0%
Nature	168 69.7 %	53 21.9 %	20 8.2%
The place where all living (people, animal...)	481 68.5 %	174 24.7 %	47 6.6%
Blank	42 53.8 %	15 19.2 %	21 26.9%

Since the people who can define the environment with more correct expressions, are accepted as the people who have a higher level of environmental awareness than the others; the willingness of these people to spend extra money they have for environmental issues is not a surprising situation since people who have a certain level of environmental awareness are expected to behave in environmental friendly manner.

5.2. Results and Discussion with Respect to Regression and Stepwise Analysis

In this chapter, multiple regression analysis was made to show the degree of impact of independent variables, indicating socio-economic structures and environmental awareness of participants, on variable Y that denotes level of environmental awareness of participants. How the variable that is investigated in the analysis, is effective on the level of regression was also intended to be determined.

After the regression analysis, the impacts of independent variables on each other were expressed as ratio through use of stepwise method.

5.2.1. Case 1: Effect of System Knowledge on Environmental Awareness

Case 1 was especially studied to analyze the effect of system knowledge on the environmental awareness of the people.

The independent variables of the predictive model we used, were selected from the questions related to the socio-economic status and environmental awareness of the participants in field studies. The variables are defined in Table 5.26.

Table 5.26. Independent variables used in Case I

VARIABLE	CORRESPONDING QUESTION NUMBER	DESCRIPTION
X1	Q2	Gender
X2	Q3	Age
X3	Q4	Education
X4	Q6	Monthly income
X5	Q7	Number of home residents
X6	Q8	Hometown
X7	Q9	Reason for coming to İstanbul
X8	Q10	Time for coming to İstanbul
X9	Q11	Number of years in Küçükçekmece Region
X10	Q12	Reason to live in Küçükçekmece Region
X11	Q13	Neighborhood have you been living
X12	Q14	Definition of environment
X13	Q16	Reasons of environmental pollution and problems
X14	Q17	Responsible parts for prevention of environmental pollution and problems
X15	Q18	Environmental sensitivity
X16	Q24	True / False (Environmental Knowledge)
X17	Q25	Results of the consumption of clean water resources
X18	Q26	Reasons of pollution in the natural water resources
X19	Q27	Institution responsible for construction of sewage system

Questions related to *system knowledge* of the participants, were especially used in this case to show the level of effect of system knowledge on the environmental awareness level of participants.

The model was a linear multivariable equation represented by Equation (5.1)

$$Y = ax_1 + bx_2 + cx_3 + dx_4 + ex_5 + fx_6 + gx_7 + \quad (5.1)$$

$$+ hx_8 + ix_9 + jx_{10} + kx_{11} + lx_{12} + mx_{13} + nx_{14} +$$

$$+ ox_{15} + px_{16} + qx_{17} + rx_{18} + sx_{19}$$

The ‘Coefficient of Multiple Determination’ (R^2) was determined by the use of DATA FIT as:

$R^2 = 0.71$. The table of regression analysis is presented in Appendix F.

The impact of each independent variable on the other variables was also investigated with the Stepwise method to show the relation between variables.

The input variables in the Stepwise method and their F values are given in Table 5.27.

Table 5.27. Input variables in Stepwise method and their F values in Case 1

VARIABLE	F VALUE
X16	979
X13	1025
X17	876
X14	787
X12	737
X18	697
X15	670
X19	630
X1	567
X9	513
X5	468
X2	430

The variables that are removed from the equation were X3, X4, X6, X7, X8, X10, X11.

The results of interrelation between variables of the model are given in Figure 5.1-5.15. These results have been obtained on the basis of the interaction of variables provided in the Correlation Matrix Table (Appendix G), which has been associated with the variables entered.

Factors presented with brackets in the results section denote the interaction between the independent and dependent variables respectively.

‘Gender’ (X1) has positive relationship with ‘Age’ (X2) (%28), ‘Income’ (X4) (%28), ‘Number of home residents’ (X5) (%11) and ‘Reason for coming to Istanbul’ (X7) (%18). Hence, age and income is higher for men with respect to women (Figure 5.1).

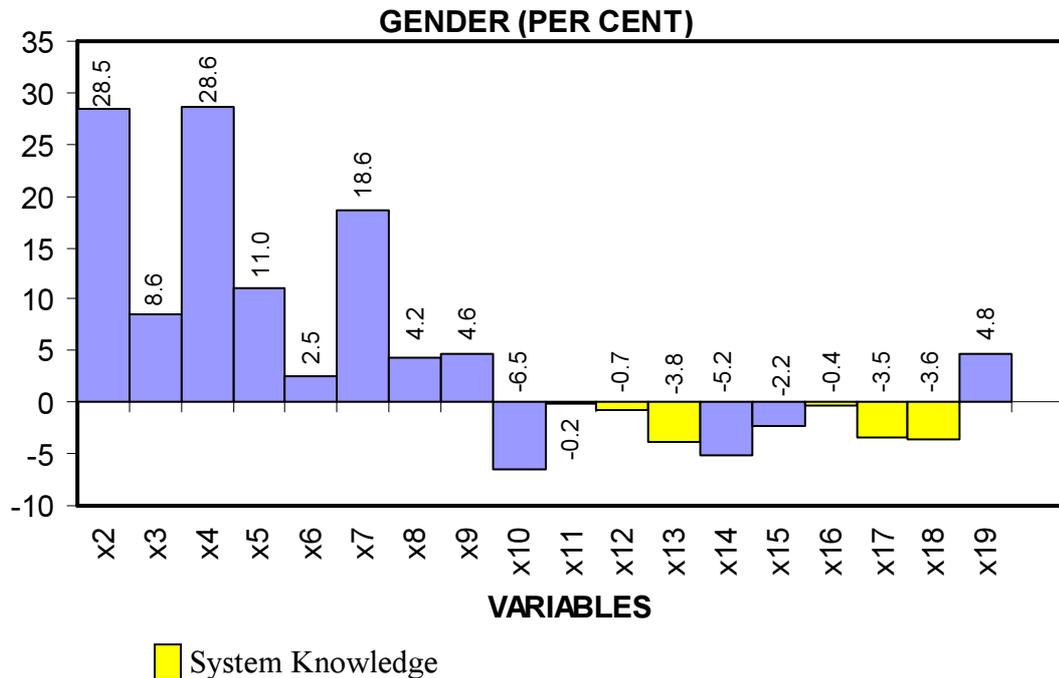


Figure 5.1. Effect of gender on other variables

‘Age’ (X2) has positive relationship with ‘Gender’ (X1) (%28) and ‘Income’ (X4) (%14); but has negative relationship with ‘Time of migration to Istanbul’ (X8) (-%10).

This result confirms the relationship mentioned above- between age, income and gender in terms of age. (Figure 5.2)

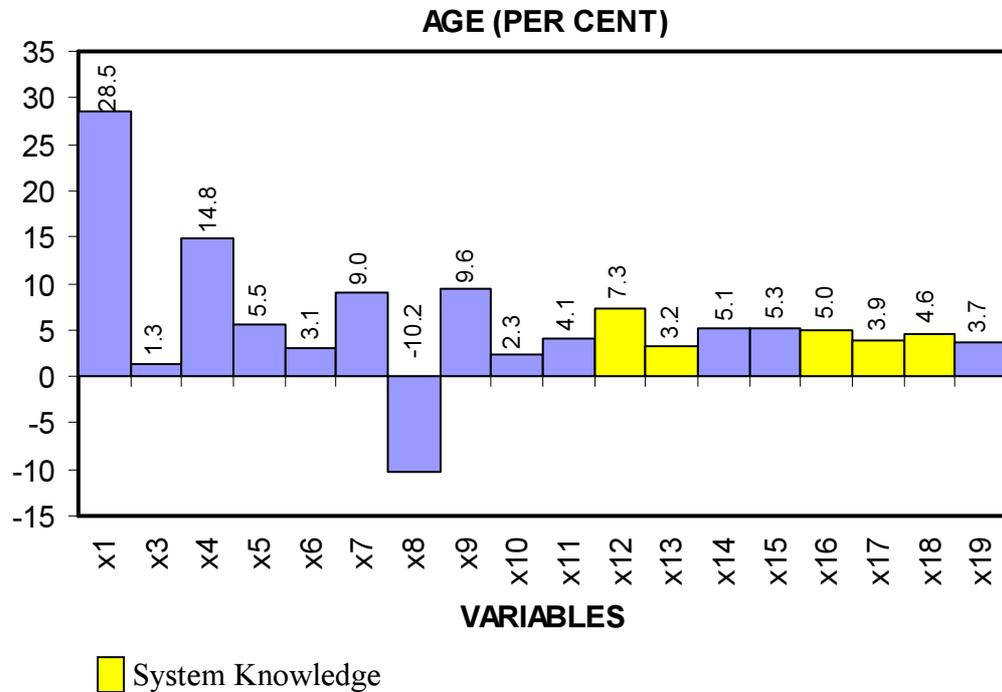


Figure 5.2. Effect of age on other variables

‘Education’ (X3), is an influencing variable on the economic condition of participants, their environmental knowledge and consciousness (Figure 5.3).

Variables; ‘Responsible Authority’ (X14) (%18), ‘Definition of Environment’ (X12) (%18), ‘Reasons of Environmental Problems’ (X13) (%17), ‘True-False’ (X16) (%17), ‘Results of Water Scarcity’ (X17) (%12) and ‘Reasons of Water Pollution’ (X18) (%11); which have been directed to participants in order to retrieve environmental knowledge are in positive relationship with education.

Results outlined above suggest that, participants with higher education levels can

- Define the environment in a clearer manner.
- Identify the causes of environmental problems in more detail.
- Express the causes and effects of pollution of water resources by their personal interpretation.

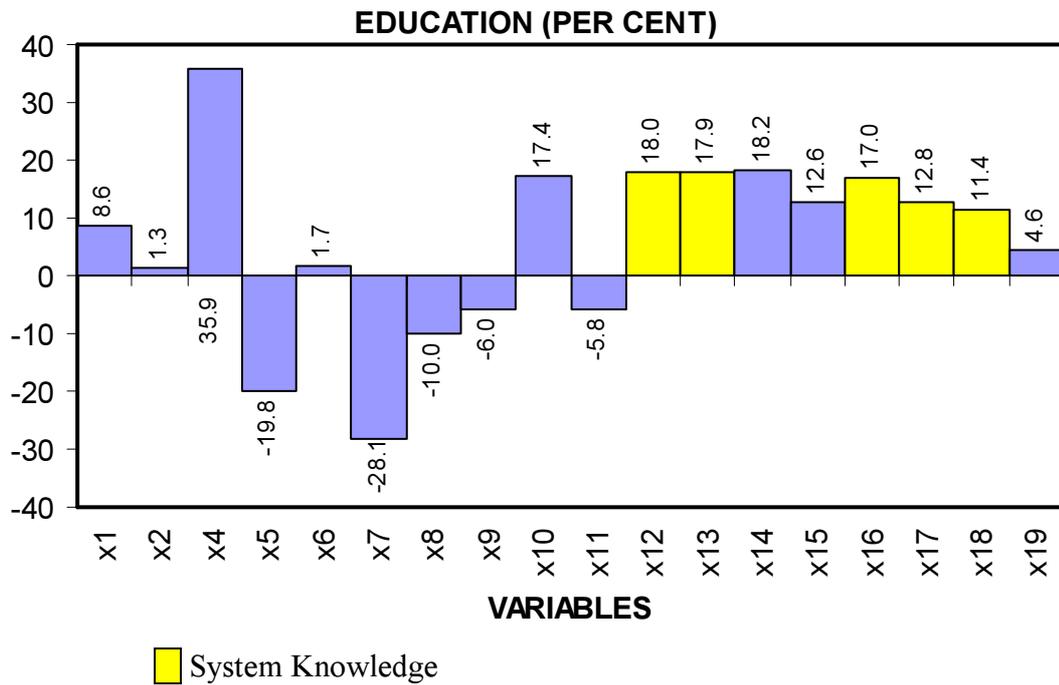


Figure 5.3. Effect of education on other variables

Hence it can be stated that, education affects the level of system knowledge that participants have.

Positive relationship between education and 'Income' (X4) (%35) suggests that education level of participants improve with increasing income level. That is, the distribution of education level exhibits a parallel distribution with income. (Figure 5.4)

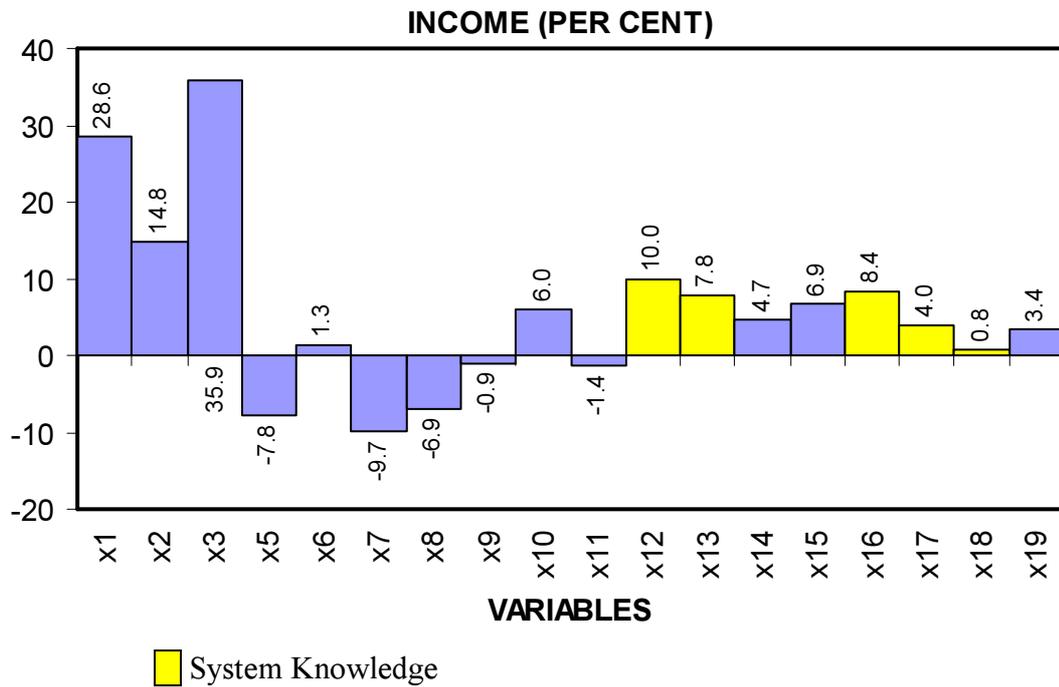


Figure 5.4. Effect of income on other variables

‘Reason for Coming to Küçükçekmece’ (X10) (%17) is positively related with education.

On the contrary to the variables outline above, ‘Reason for Coming to İstanbul’ (X7) (-%28), ‘Home Residents’ (X5) (-%19) and ‘Settling date at İstanbul’ (X8) (-%10) are in negative relationship with education. Thus, it has been observed that, aside from being born in İstanbul, relatives in living in İstanbul or appointment are the primary reasons to come to İstanbul for those who are more educated among participants from Küçükçekmece residents.

These group of participants came to İstanbul in earlier times and have comparatively less crowded families, for whom certain interests in İstanbul influenced these participants to come to İstanbul rather than their homeland or hometown conditions.

Considering also the interaction between ‘Number of home residents’ (X5) and ‘Hometown / Region’ (X6) (%12) besides the positive interaction between ‘Number of

home residents' (X5) and 'Settling date at İstanbul' (X8) (%15), as (Figure 5.5) shows, it has been observed that:

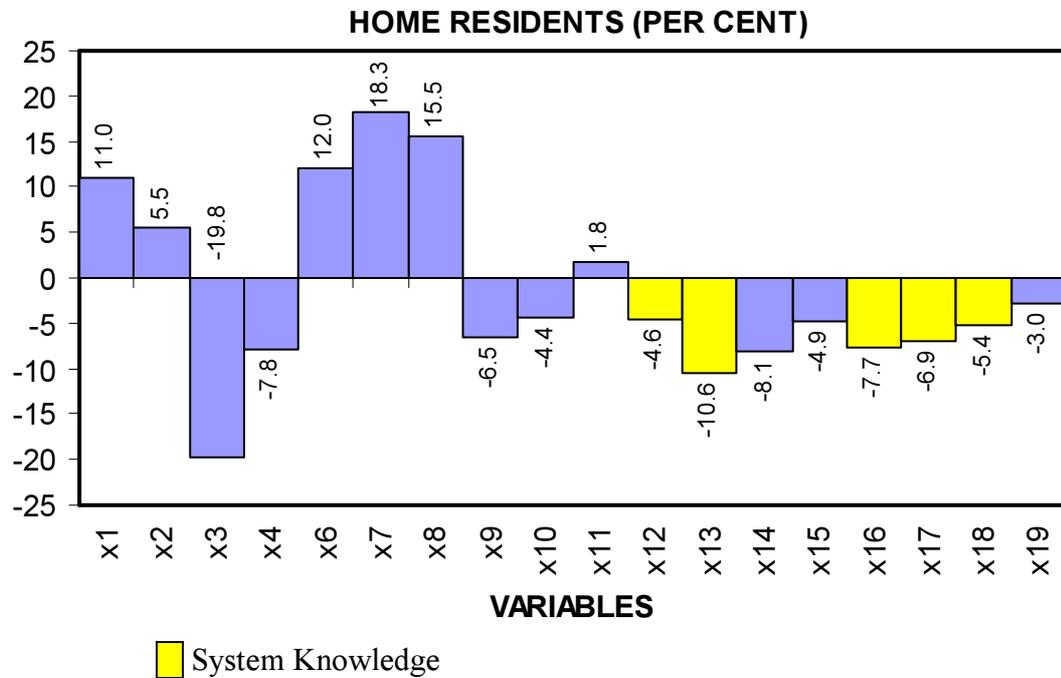


Figure 5.5. Effect of home residents on other variables

Those who come to İstanbul due to terror, unemployment, decreasing land share as a consequence of teeming siblings at homeland, are also those who came to İstanbul not long ago, have crowded families and are either from Central, East or South-East Anatolia as well.

'Hometown / Region' (X6) analysis also supports the conclusion above. Participants who are born in İstanbul, have relatives in living in İstanbul or living in İstanbul due to appointment are also those who have origins from Marmara, Aegean or Mediterranean regions of Turkey (Figure 5.6).

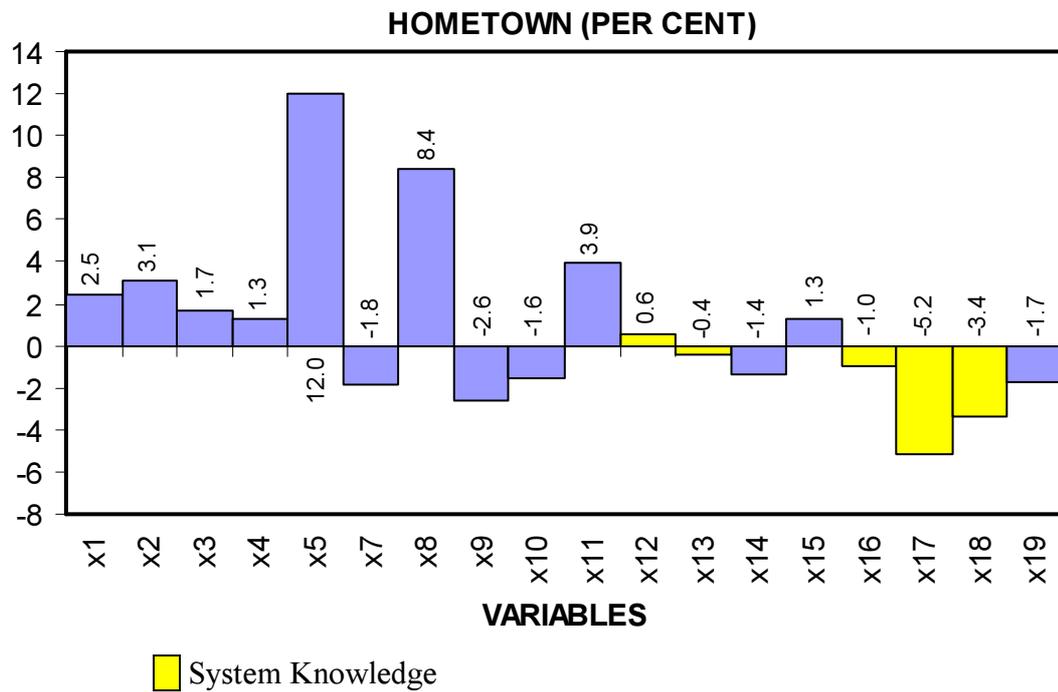


Figure 5.6. Effect of hometown on other variables

Detailed analysis of ‘Reason for Coming to Istanbul’ (X7) reveal that (Figure 5.7), in spite of positively related variables expressed above, not only it is negatively effected by Education but also ‘Year in Küçükçekmece (X9)’ (-%15), ‘Reason for Coming to Küçükçekmece’ (X10) (-%16), ‘Reasons of Environmental Problems’ (X13) (-%10), ‘Responsible Authority’ (X14) (-%12) and ‘True-False’ (X16) (-%10).

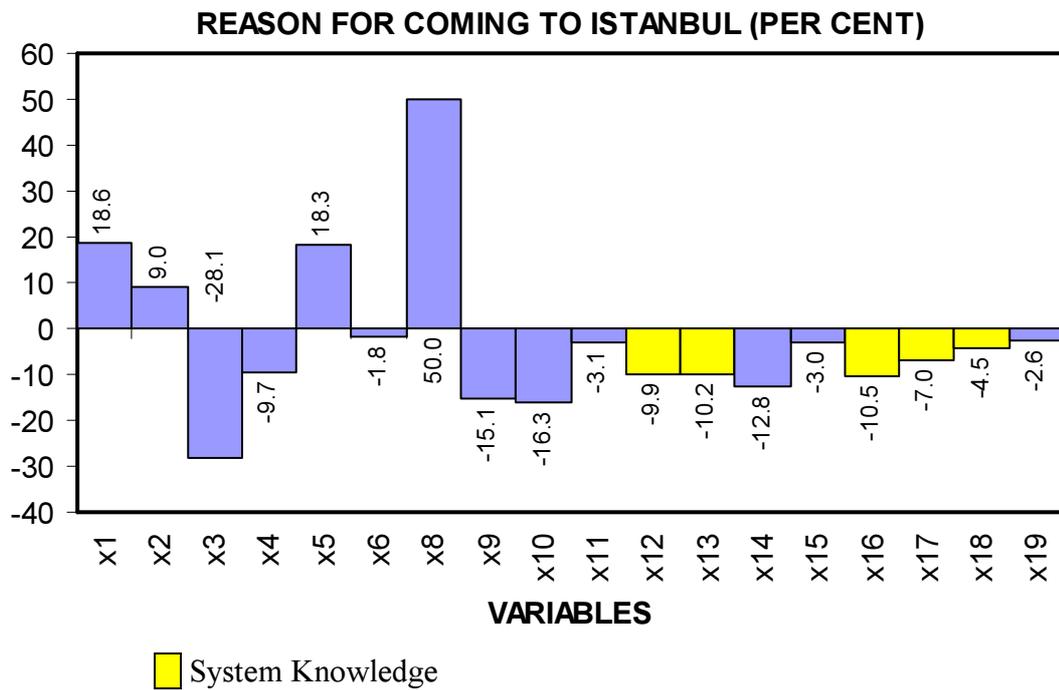


Figure 5.7. Effect of reason for coming to Istanbul on other variables

Information and analysis results stated above suggest that, participants migrated to Istanbul due to unemployment or terror at their hometowns possesses the common characteristics below

- Family origins from Central, East or Southeast regions of Turkey
- Lower education levels
- Inadequacy to answer questions regarding responsible institutions to prevent these problems
- Inadequacy to answer system knowledge questions about reasons of environmental problems and evaluations of environmental knowledge as true or false

Investigation of the relation of 'Neighborhood' (X11) with all other variables indicates that, socio-economic conditions and environmental concerns of the participants are not strongly affected by the neighborhoods or districts in Küçükçekmece (Figure 5.8).

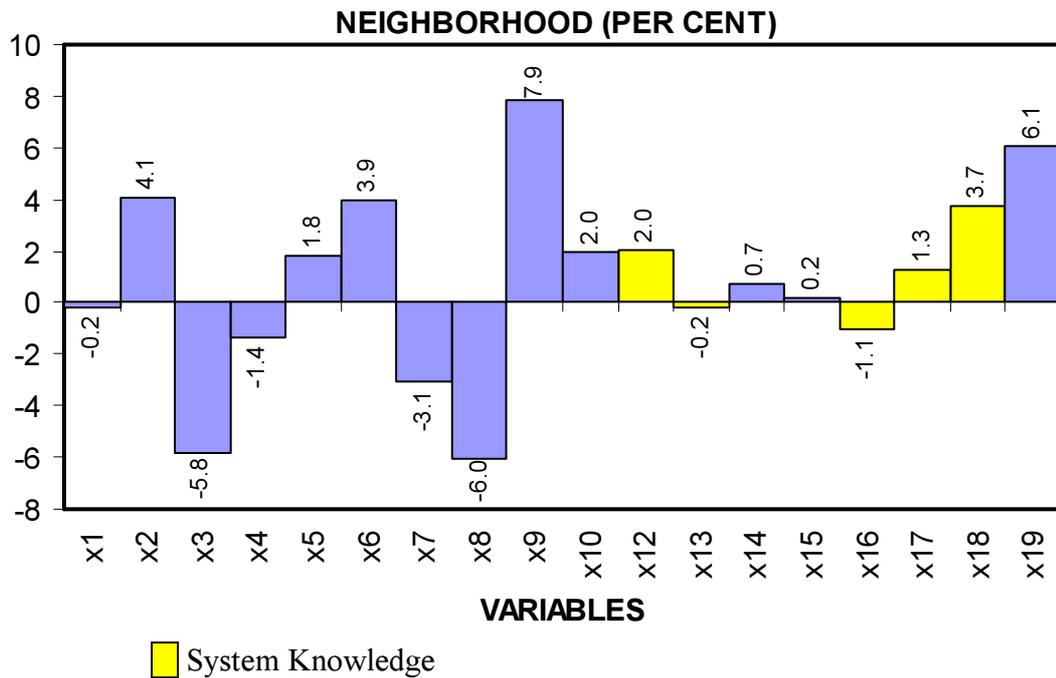


Figure 5.8. Effect of neighborhood on other variables

It has been observed that ‘Definition of Environment’ (X12) has positive relationship with ‘Reasons of Environmental Problems’ (X13) (%18), ‘Responsible Authority’ (X14) (%15), ‘True-False’ (X16) (%12), ‘Reasons of Water Pollution’ (X18) (%10) and ‘Education’ (X3) (%18). (Figure 5.9).

Hence, participants who have system knowledge about definition of environment, have been observed to answer the questions below as well.

- Other system knowledge questions about causes of environmental problems, evaluation of environmental knowledge as true or false and reasons of pollution in water resources.
- Question about responsible people or institutions for prevention of pollution.

However, results indicate that clearer answers to ‘Definition of Environment’ (X12) could be achieved as with enhanced education levels of the participants. This conclusion implies the positive effect of education on environmental knowledge.

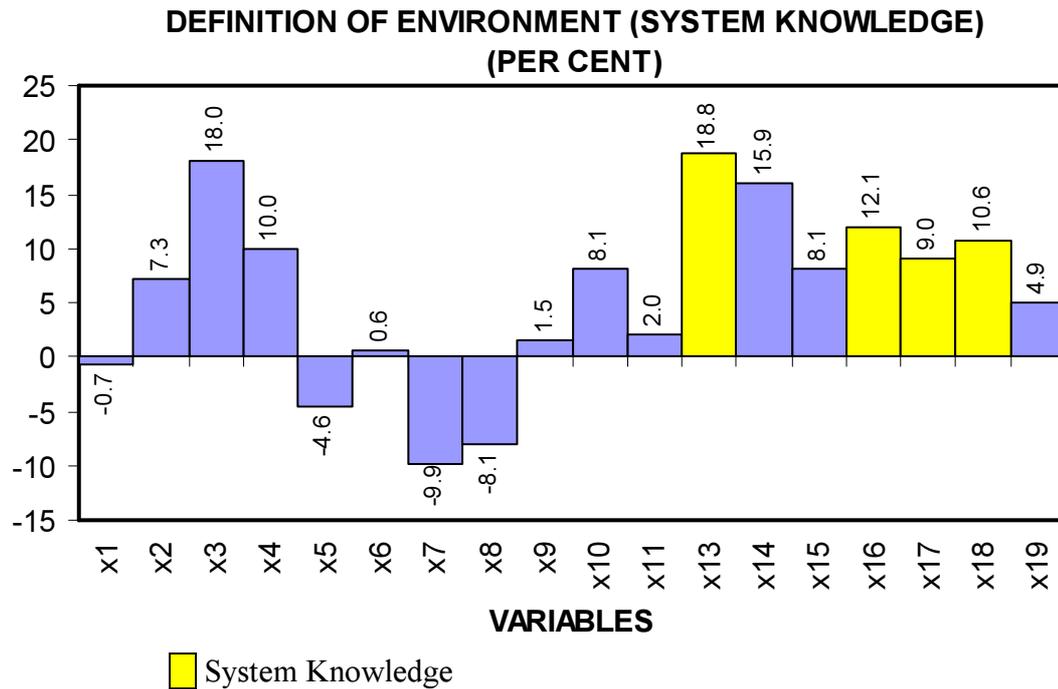


Figure 5.9. Effect of definition of environment on other variables

‘Reasons of Environmental Problems’ (X13) has been observed to be in positive relationship with ‘Responsible Authority’ (X14) (%48), ‘True-False’ (X16) (%23), ‘Definition of Environment’ (X12) (%18), ‘Results of Water Scarcity’ (X17) (%17), ‘Reasons of Water Pollution’ (X18) (%16), ‘Environmental Sensitivity’ (X15) (%13) and ‘Education’ (X3) (%17) as shown (Figure 5.10).

Awareness of participants to the causes of environmental problems imply that, other questions on system knowledge can be answered as well by those who consider themselves as sensitive to environment.

The positive relationship between ‘Reasons of Environmental Problems’ (X13) and ‘Education’ (X3) is also important to see the contribution of education to system knowledge one more time.

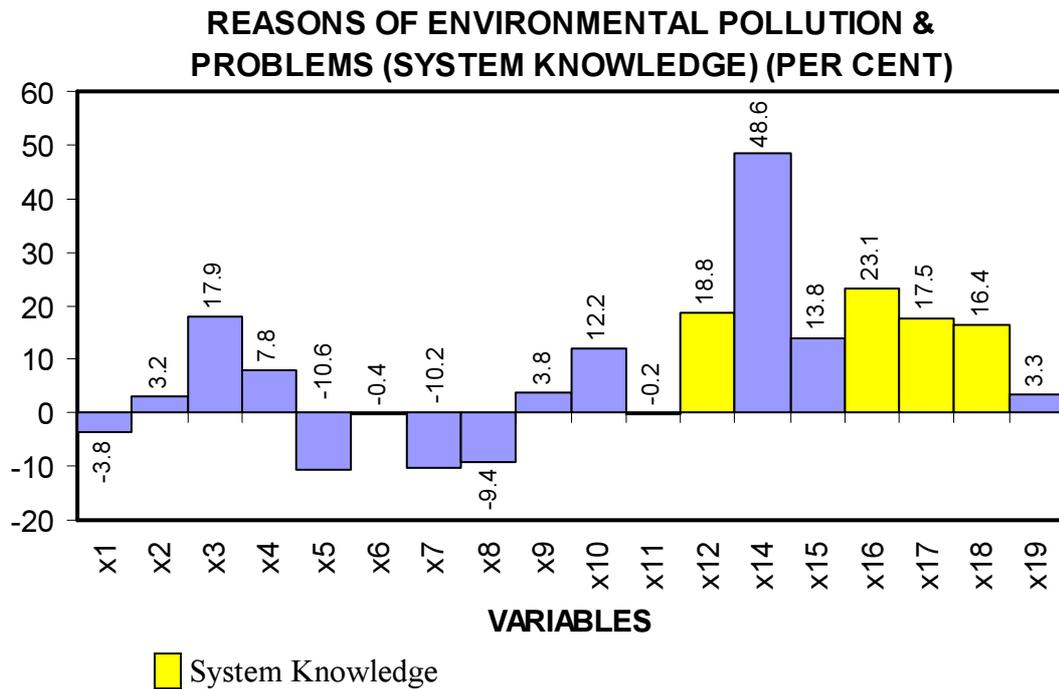


Figure 5.10. Correlation of reasons of environmental pollution and problems with other variables

Analysis of the other questions asked to determine system knowledge of participants such as 'True-False' (X16) (Figure 5.11), 'Results of Water Scarcity' (X17) (Figure 5.12) and 'Reasons of Water Pollution' (X18) (Figure 5.13) indicate that these questions also have positive relationship with other questions regarding system knowledge.

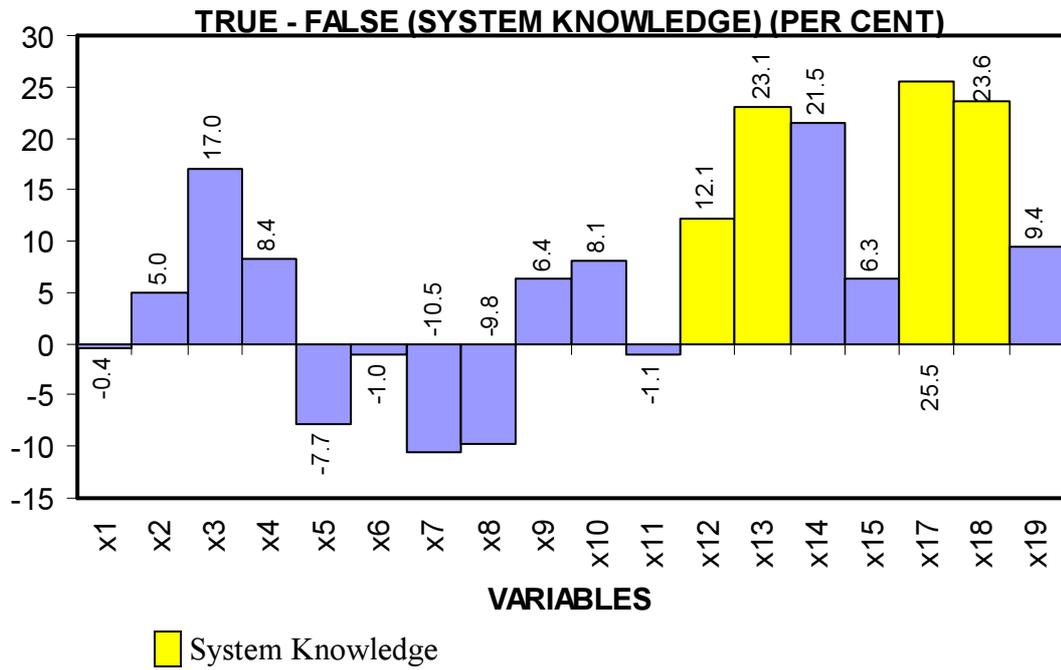


Figure 5.11. Correlation of true-false knowledge questions with other variables

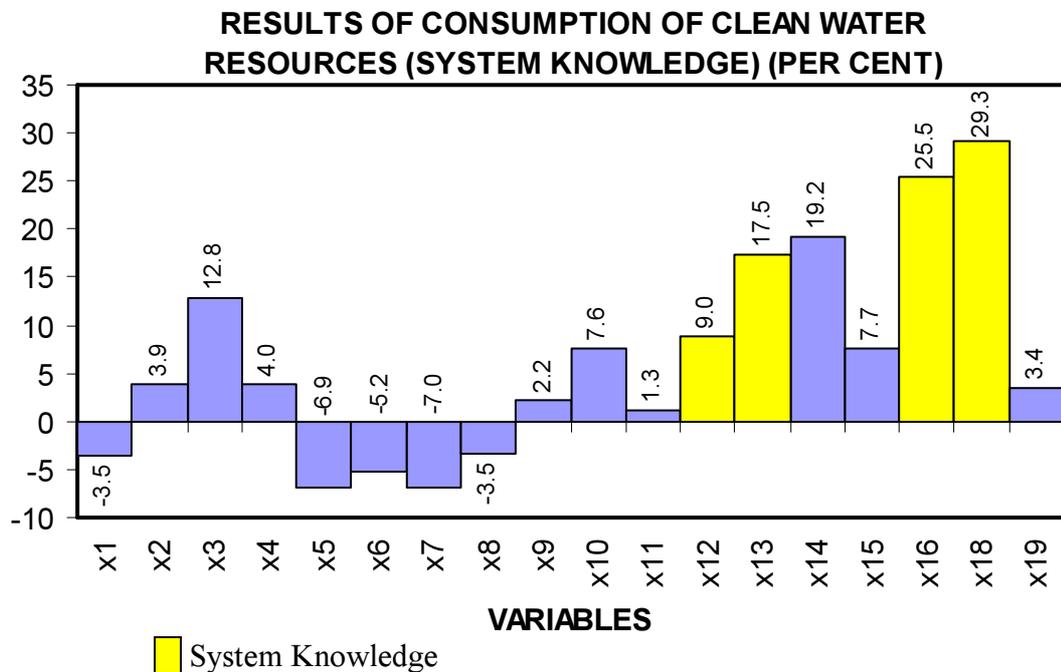


Figure 5.12. Correlation of consequences of clean water resources consumption with other variables

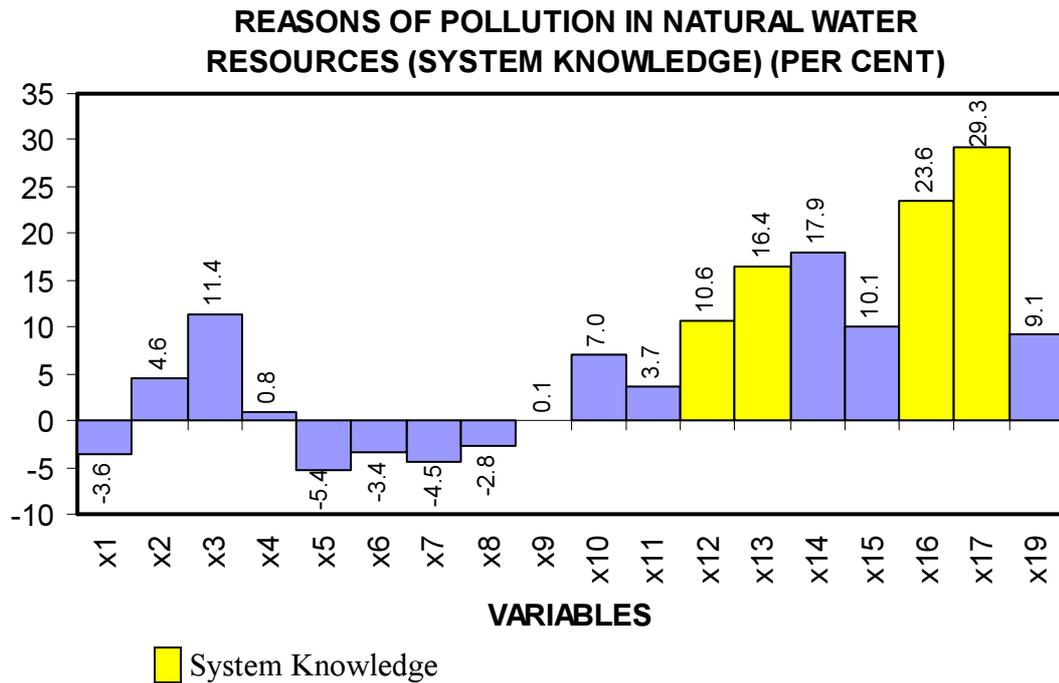


Figure 5.13. Correlation of reasons of pollution in natural water resources with other variables

‘Education’ has been observed to be in positive relationship with all questions mentioned in the previous paragraph.

It has been observed that ‘Environmental Sensitivity’ (X15) has positive relationship with ‘Reasons of Environmental Problems’ (X13) (%13), ‘Responsible Authority’ (X14) (%13), ‘Reasons of Water Pollution’ (X18) (10%) and ‘Education’ (X3) (12%) (Figure 5.14).

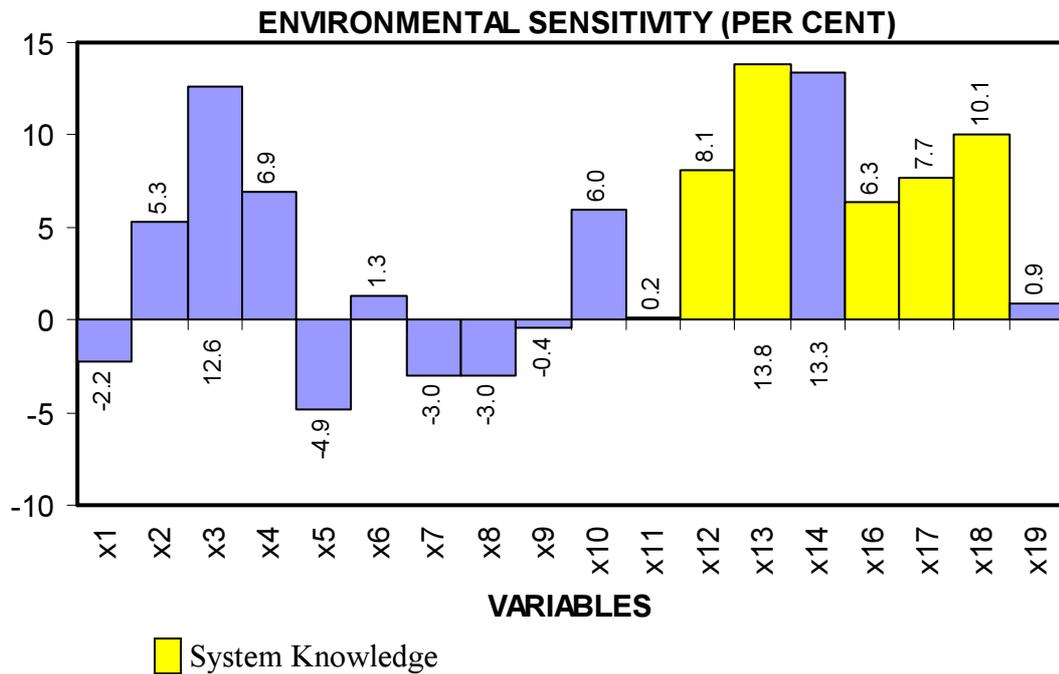


Figure 5.14. Correlation of environmental sensitivity with other variables

Hence, participants who can identify themselves as the people who have environmental sensitivity, have been observed to have knowledge about reasons of environmental pollution and problems, responsible institutions to mitigate these problems and reasons of pollution of water resources. These results are important because they exhibit that the people, defining themselves as the people who have environmental sensitivity, also have system knowledge.

Investigation of the relation of 'Sewage authority' (X19) with all other variables indicates that, socio-economic conditions and environmental concerns of the participants do not generally have strong relationship with responding the question asking the institution that is responsible for construction of sewage system and taking away wastewaters as shown in (Figure 5.15).

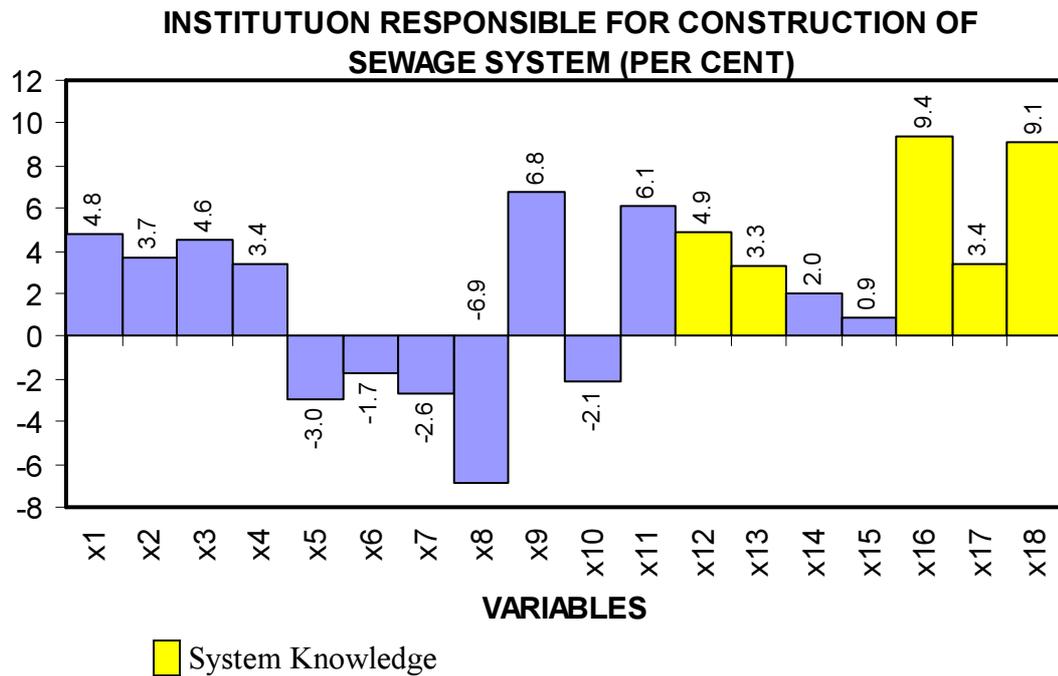


Figure 5.15. Correlation of institution responsible for construction of sewage system with other variables

Within all these variables, the variables which have the most powerful effect in Y, denoting level of awareness of participants are ‘True/False’ (X16) with 58%, ‘Reasons of Environmental Problems’ (X13) with 54%, ‘Responsible Authority’ (X14) with 51 %, ‘Results of Water Scarcity’ (X17) with 43%, ‘Reasons of Water Pollution’ (X18) with 42 % and ‘Definition of Environment’ (X12) with 34%.

They are followed by ‘Environmental Sensitivity’ (X15) (28%), ‘Education’ (X3) (24%) and ‘Sewage System’ (X19) (19%).

‘True/False’ (X16), ‘Reasons of Environmental Problems’ (X13), ‘Results of Water Scarcity’ (X17), ‘Reasons of Water Pollution’ (X18) and ‘Definition of Environment’ (X12) are ‘*system knowledge questions*’, as mentioned before. Their ‘Variation Inflation Factors’ were calculated as (1.17), (1.38), (1.16), (1.16) and (1.08).

In this case, Prob (t) values for ‘Income’ (X4), ‘Homeland’ (X6) and ‘Reason for Coming to İstanbul’ (X7) were calculated as (0.2), (0.3) and (0.2), respectively. Although

their P value is higher than 0.0, they can not be removed from the equation. In this study, one of the aims is to determine the relationship between socio-economic structure of the people in the basin and their environmental awareness. For the achievement of this aim, some questions were asked towards social, economic and also cultural structures of the people. Since the question whose P values are higher than 0.0 are the question about socio-economic structure, they were not removed.

5.2.2. Case 2: Effect of Indigenous Environmental Knowledge on Environmental Awareness

Case 2 was studied to analyze the effect of the indigenous environmental knowledge on the environmental awareness of the people.

The independent variables of the predictive model we used in this case, are the same variables in the Case 1 except for only two of them. The difference between two cases is based on addition of *indigenous environmental knowledge* questions such as ‘Environmental Pollution and Problems’ (X13) and ‘Opinion about Küçükçekmece Lagoon’ (X20) to the variables and exclusion of ‘Sewage System’ from the variables in the second case. The variables are defined in Table 5.28.

Table 5.28. Independent variables used in Case II

VARIABLE	CORRESPONDING QUESTION NUMBER	DESCRIPTION
X1	Q2	Gender
X2	Q3	Age
X3	Q4	Education
X4	Q6	Monthly income
X5	Q7	Number of home residents
X6	Q8	Hometown
X7	Q9	Reason for coming to İstanbul
X8	Q10	Time for coming to İstanbul
X9	Q11	Number of years in Küçükçekmece Region
X10	Q12	Reason to live in Küçükçekmece Region
X11	Q13	Neighborhood have you been living
X12	Q14	Definition of environment
X13	Q15	Environmental pollution and problems in neighborhood
X14	Q16	Reasons of environmental pollution and problems
X15	Q17	Responsible parts for prevention of environmental pollution and problems
X16	Q18	Environmental sensitivity
X17	Q24	True / False (Environmental Knowledge)
X18	Q25	Results of the consumption of clean water resources
X19	Q26	Reasons of pollution in the natural water resources
X20	Q20	Opinion about Küçükçekmece Lagoon

Questions related to *indigenous environmental knowledge* of the participants were especially used in this case to show the level of effect of indigenous knowledge on environmental awareness level of participants.

The model was a linear multivariable equation represented by Equation (5.2).

$$\begin{aligned}
 Y = & ax_1 + bx_2 + cx_3 + dx_4 + ex_5 + fx_6 + gx_7 + \\
 & + hx_8 + ix_9 + jx_{10} + kx_{11} + lx_{12} + mx_{13} + nx_{14} + \\
 & + ox_{15} + px_{16} + qx_{17} + rx_{18} + sx_{19} + sx_{20}
 \end{aligned}
 \tag{5.2}$$

The ‘Coefficient of Multiple Determination’ (R^2) was determined by the use of DATA FIT as: $R^2 = 0.73$. The table of regression analysis is presented in Appendix H.

The impact of each independent variable on the other variables was also investigated with the Stepwise method to show the relation between variables.

The input variables in the Stepwise method and their F values are given in Table 5.29.

Table 5.29. Input variables in Stepwise method and their F values in Case 2

VARIABLE	F VALUE
X17	979
X14	1025
X18	876
X15	787
X12	737
X19	697
X16	670
X13	648
X20	590
X1	537
X5	492
X2	453
X3	420
X9	391

The variables that were removed from the equation were X4, X6, X7, X8, X10, X11.

The difference between results of Case 1 and Case 2 is based on the relations of *indigenous environmental knowledge questions* such as ‘Environmental Pollution and Problems’ (X13) and ‘Opinion about Küçükçekmece Lagoon’ (X20) to other variables in Case 2. The results of interrelation between indigenous environmental questions and other variables of the model are given in Figure 5.16 and 5.17. These results have been obtained

on the basis of the interaction of variables provided in the Correlation Matrix Table (Appendix I), which has been associated with the variables entered.

Results reveal that 'Environmental Pollution and Problems' (X13) is positively related with 'Reasons of Environmental Problems' (X14) (%43), 'Responsible Authority' (X15) (%30), 'Environmental Sensitivity' (X16) (%11) and 'True-False' (X17) (%10) (Figure 5.16).

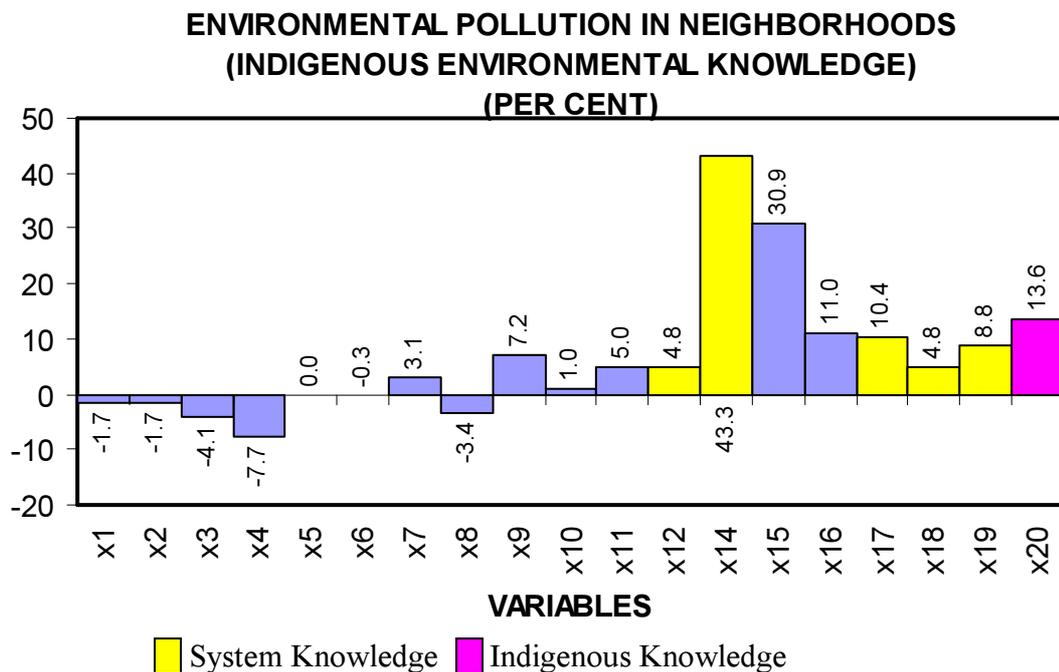


Figure 5.16. Correlation of environmental pollution in neighborhoods with other variables

These findings indicate that, causes of environmental problems, responsible institutions to mitigate these problems and environmental knowledge in general sense designated by true or false questions can be comprehended by participants who determine environmental pollution and problems in their neighborhoods. These people also consider themselves as sensitive to environment according to results given above.

Surprisingly, X13 has been found to be in negative relationship with 'Education' (X3) (-% 4). It is believed that this result is due to mistakes in the way of expression of the question since all other questions regarding environmental knowledge indicate positive relationship with education. Apart from environmental pollution and problems asked in the

question in tandem, possible consideration of neighborhood conditions while answering might have caused confusion on the participant and thus unexpected relationship with education.

‘Opinion about Küçükçekmece Lagoon’ (X20) has been observed in positive relationship with ‘Definition of Environment’ (X12) (10%), ‘Environmental Pollution and Problems’ (X13) (13%), ‘Reasons of Environmental Problems’ (X14) (12%), ‘True-False’ (X17) (10%), ‘Results of Water Scarcity’ (X18) (12%) and ‘Reasons of Water Pollution’ (X19) (11%).

On the contrary, ‘Settling Date in İstanbul’ (X8) (- 12%) is negatively associated with ‘Opinion about Küçükçekmece Lagoon’ (X20) as shown in (Figure 5.17).

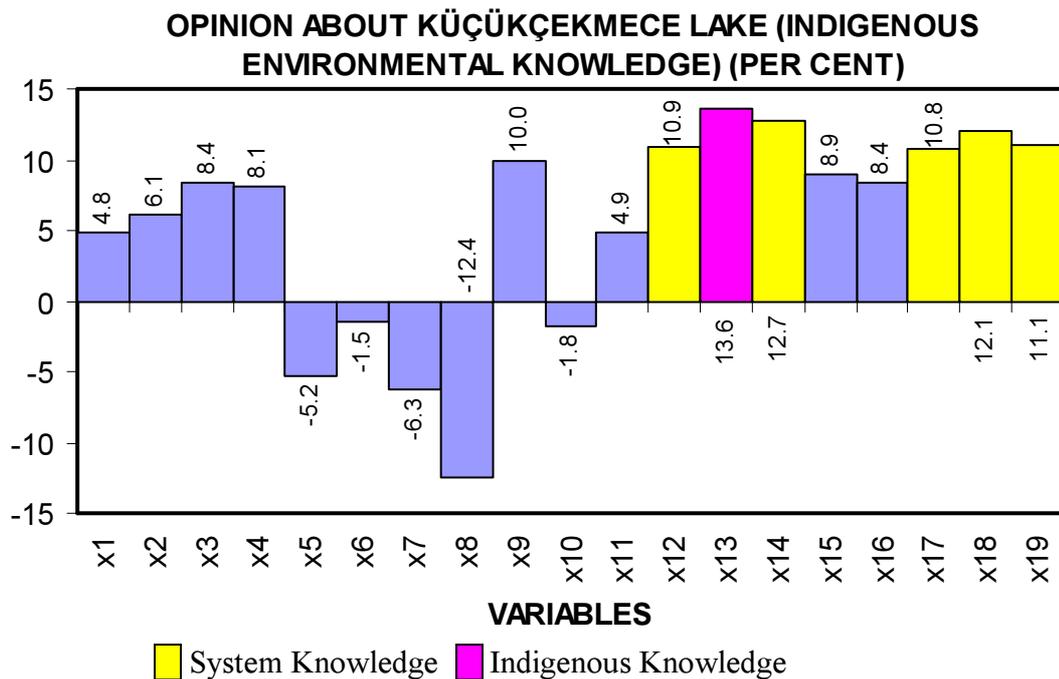


Figure 5.17. Correlation of opinion about Küçükçekmece Lagoon with other variables

According to these results, the participants who

- Can define ‘environment’
- Know the environmental pollution and problems in their neighborhoods

- Know reasons of general environmental problems
- Can identify environmental knowledge as true or false correctly and
- Know the reasons of pollution in and results of consumption of water resources

have been observed not either to have correct information about or to be interested in current pollution state in Küçükçekmece Lagoon.

The order and values of the variables in terms of their effects on Y, denoting environmental awareness of participants, are similar to the first case. In second case, the variables have been arranged as in the following paragraph according to their contribution to the level of awareness (Y) of people:

‘True/False’ (X17) (58%), ‘Reasons of Environmental Problems’ (X14) (54%), ‘Responsible Authority’ (X15) (51%), ‘Results of Water Scarcity’ (X18) (43%), ‘Reasons of Water Pollution’ (X19) (42%), ‘Environmental Pollution and Problems’ (X13) (38%), ‘Definition of Environment’ (X12) (34%), ‘Environmental Sensitivity’ (X16) (28%), ‘Education’ (X3) (24%) and ‘Opinion about Küçükçekmece Lagoon (X20) (24%).

According to these results, system knowledge questions can be accepted as much more effective than indigenous environmental questions in the level of environmental awareness of participants.

‘Variance Inflation Factors’ of system knowledge questions are the same in Case 1 except for ‘Reasons of Environmental Pollution’. Its value risen from 1.38 to 1.58. The ‘Variance Inflation Factors’ of indigenous environmental knowledge questions were calculated as 1.32 for ‘Environmental Pollution and Problems’ (X13) and 1.07 for ‘Opinion about Pollution in Küçükçekmece Lagoon’.

In Case 2, Prob (t) values for ‘Number of Home Residents’ (X5), ‘Homeland’ (X6) and ‘Reason for Coming to İstanbul’ (X7) were calculated as (0.2), (0.3) and (0.6), respectively. Although their P value is higher than 0.0, they can not be removed from the equation due to the same reasons given in Case 1.

5.2.3. Case 3: Effect of Environmental Attitude on Environmental Awareness

Case 3 was studied to analyze the effect of *environmental attitude* on the environmental awareness of the people.

The independent variables of the predictive model we used in Case 3, are similar to the variables in Case 2 except for three of them. Question 21 ‘Eating fish from Küçükçekmece Lagoon’, Question 27 ‘Sewage Authority’ and Question 20 ‘Opinion About Küçükçekmece Lagoon’ in Case 3 replaced Question 9 ‘Reason for coming to Istanbul’ (X7), Question 12 ‘Reason for choosing Küçükçekmece’ (X10), and Question 13 ‘Neighborhood’ (X11), respectively. In addition to them, *‘environmental attitude question’* was added to the variables with Question 19 ‘Regret’ as (X20). The variables in Case 3 are defined in Table 5.30.

Q21 ‘Eating fish from Küçükçekmece Lagoon’ (X7) and Q27 ‘Sewage Authority’ (X10) were asked to find out whether the basin population is aware of the pollution in the Lagoon and its harm to human health according to the decisions about eating the fish caught in Küçükçekmece Lagoon and whether the basin population has knowledge about responsibilities of institutions in protection of the environment and prevention of the pollution, respectively.

Q 20 ‘Opinion About Küçükçekmece Lagoon’ is important to learn whether the basin population is aware of the current pollution state in Küçükçekmece Lagoon.

Question 19 ‘Regret’ is a question asked to find out whether the participants harm to environment through their behaviors. The attitudes of participants toward certain behaviors whose results can negatively affect environment were explored for this reason. This question, related to *environmental attitude* of the participants, was especially used in this case to show the level of effect of environmental attitude on environmental awareness level of participants.

Table 5.30. Independent variables used in Case 3

VARIABLE	CORRESPONDING QUESTION NUMBER	DESCRIPTION
X1	Q2	Gender
X2	Q3	Age
X3	Q4	Education
X4	Q6	Monthly income
X5	Q7	Number of home residents
X6	Q8	Hometown
X7	Q21	Eating fish caught in Küçükçekmece Lagoon
X8	Q10	Time for coming to İstanbul
X9	Q11	Number of years in Küçükçekmece Region
X10	Q27	Institution responsible for construction of sawage system
X11	Q20	Opinion about Küçükçekmece Lagoon
X12	Q14	Definition of environment
X13	Q15	Environmental pollution and problems in neighborhood
X14	Q16	Reasons of environmental pollution and problems
X15	Q17	Responsible parts for prevention of environmental pollution and problems
X16	Q18	Environmental sensitivity
X17	Q24	True / False (Environmental Knowledge)
X18	Q25	Results of the consumption of clean water resources
X19	Q26	Reasons of pollution in the natural water resources
X20	Q19	Regret (Environmental attitude)

The model was a linear multivariable equation represented by Equation (5.3)

$$\begin{aligned}
 Y = & ax_1 + bx_2 + cx_3 + dx_4 + ex_5 + fx_6 + gx_7 + \\
 & + hx_8 + ix_9 + jx_{10} + kx_{11} + lx_{12} + mx_{13} + nx_{14} + \\
 & + ox_{15} + px_{16} + qx_{17} + rx_{18} + sx_{19} + sx_{20}
 \end{aligned}
 \tag{5.3}$$

The ‘Coefficient of Multiple Determination’ (R^2) was determined by the use of DATA FIT as $R^2 = 0.98$. The table of regression analysis is presented in Appendix J.

The impact of each independent variable on the other variables was also investigated with the Stepwise method to show the relation between variables.

The input variables in the Stepwise method and their F values are given in Table 5.31.

Table 5.31. Input variables in Stepwise method and their F values in Case 3

VARIABLE	F VALUE
X20	1713
X17	2159
X14	3109
X12	3089
X18	3322
X13	3863
X15	4584
X10	5398
X16	6399
X11	7688
X19	9843
X7	11918
X3	11054
X8	10292
X6	9621

The variables which were removed from the equation were X1, X2, X4, X5, X9.

Results given below have been obtained based on the interaction of variables provided in the Correlation Matrix Table (Appendix K) which has been associated with the variables entered.

‘Eating fish from Küçükçekmece Lagoon’ (X7) is positively associated with ‘Opinion About Küçükçekmece Lagoon’ (X11) with (20%). It is interesting that participants who do not want to eat the fish, caught in Küçükçekmece Lagoon, are the people who either do not have right information about current pollution state in the Lagoon

or are not interested in the Lagoon. The relation of 'Eating fish from Küçükçekmece Lagoon' (X7) to other variables are very small.

Degree of relation of 'Sewage Authority' (X10) to other variables is very low in case 3. The values indicating these degrees are similar to the values that show the relation of 'Sewage Authority' to other variables in Case 1.

Hence, socio-economic conditions and environmental concerns of the participants do not strongly affect the decision about eating the fish in Küçükçekmece Lagoon and the level of knowledge about the institution which has responsible for construction of sewage system.

Relation of 'Opinion About Küçükçekmece Lagoon' (X11) to other variables is also similar the relations given in Case II for this variable.

Contrary to the relations found in previous cases, the relation between 'Age' (X2) and 'Date for Settling in İstanbul' (X8) was converted from (- 0.10) to (-0.09).

'Regret' (X20) was associated with other variables as in the following paragraph:

'Gender' (X1) (-11%), 'Education' (X3) (10%), 'Reasons of Environmental Problems' (X14) (11%), 'Responsible Authority' (X15) (13%), 'Environmental Sensitivity' (X16) (14%), 'True-False' (X17) (18%), 'Results of Water Scarcity' (X18) (15%) and 'Reasons of Water Pollution' (X19) (19%) (Figure 5.18).

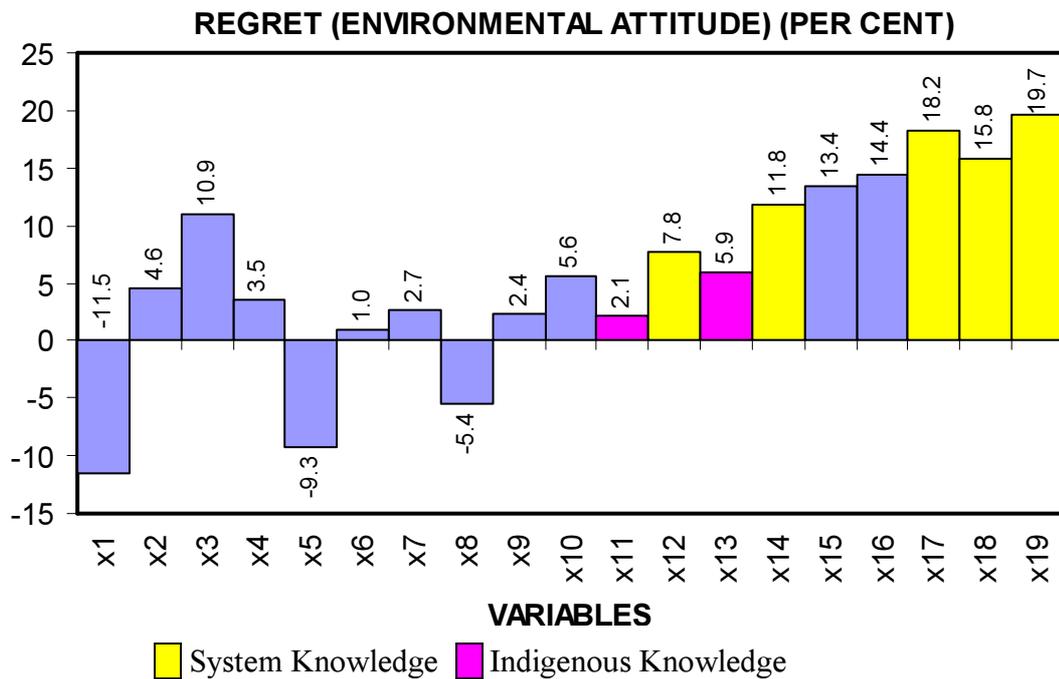


Figure 5.18. Correlation of regret (environmental attitude) with other variables

Hence, participants who can have the characteristics below have been observed to be more sensitive about consequences of their behavior on the environment as well:

- To be female
- To be more educated
- To know responsible institutions to prevent environmental pollution and problems
- To identify themselves as the people who have environmental sensitivity
- To have system knowledge about reasons of environmental pollution and problems, determination of environmental knowledge as correct or false, and results of consumption of and reasons of pollution in water resources.

It has been observed that environmental attitude question is much more effective on level of environmental awareness of participants (Y) than system knowledge and indigenous environmental knowledge questions with (0.68) as presented in (Figure 5.19).

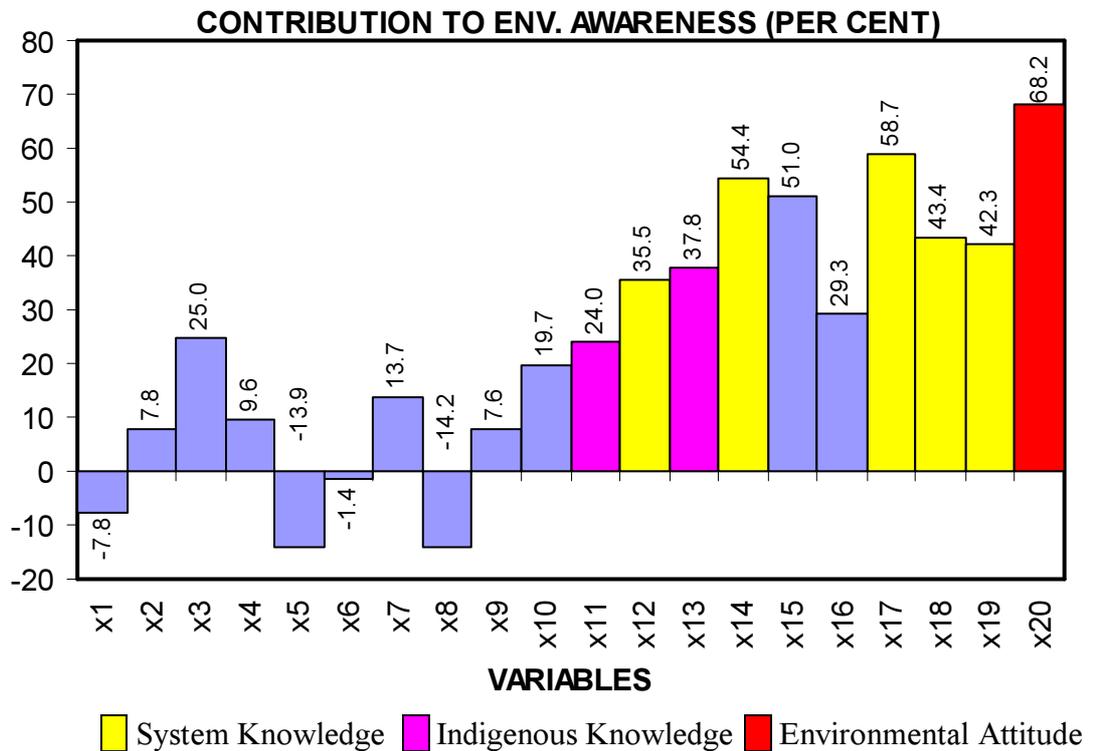


Figure 5.19. Correlation of environmental awareness with other variables

The values of ‘Variation Inflation Factors’ of *system knowledge questions* in this case are similar to the values found in previous case studies. Apart from Case 2, the ‘Variation Inflation Factor’ of ‘Opinion about Pollution in Küçükçekmece Lagoon’ was risen from 1.07 to 1.11. The ‘Variation Inflation Factor’ of *environmental attitude question* was calculated as 1.11.

In this case, Prob (t) values for ‘Gender’ (X1), ‘Age’ (X2), ‘Income’ (X4) and ‘Homeland’ (X6) were calculated as (0.1), (0.1), (0.3) and (0.1). Although their P value is higher than 0.0, they can not be removed from the equation due to the same reasons given in Case 1 and 2.

System Knowledge, Indigenous Environmental Knowledge and Environmental Attitude can be regarded as main indicators of environmental awareness of people. But, the statistical analysis have revealed these indicators can become independent from each other.

Results denoting relationships among these variables are as indicated below:

- The exploration of the relationships between variables indicating system knowledge and indigenous environmental knowledge about current pollution state in Küçükçekmece Lagoon have showed that although the people have system knowledge about ‘Definition of Environment’ (10%), ‘Determination of Environmental Knowledge as True or False’ (10%), ‘Results of Consumption of Water Resources’ (12%) and ‘Reasons of Pollution of Water Resources’ (11%), they have no correct indigenous environmental knowledge about pollution state in the Lagoon according to Case 2.
- The same situation is seen in the people who have indigenous environmental knowledge about environmental pollution and problems in their neighborhoods as well. According to relations of ‘Opinion About Küçükçekmece Lagoon’ (X20) to ‘Environmental Pollution and Problems’ (13%), although the people know the environmental pollution and problems in their neighborhoods, they can not be aware of the current pollution state in Küçükçekmece Lagoon (Case 2).
- The investigation of the relationship between ‘Opinion About Küçükçekmece Lagoon’ (X11) and environmental attitude towards environment (2 %) have showed that there is no any relationship between the environmental attitude people have and their interest to pollution state in Küçükçekmece Lagoon in Case 3.
- The investigation of the relationships between variables indicating system knowledge and environmental attitude of the people have revealed that the people who have positive environmental attitude towards the environment (X20 in Case 3), have also system knowledge about ‘Reasons of Environmental Knowledge and Problems’ (11%), ‘Determination of Environmental Knowledge as True or False’ (18%), ‘Results of Consumption of Water Resources’ (15%) and ‘Reasons of Pollution of Water Resources’ (19%). Education is also positively associated with all these variables related to system knowledge and environmental attitude. According to these results, people gain system knowledge with education and system knowledge provides people to have in positive environmental attitude towards the environment.

- There is no a significant relationship between *indigenous environmental knowledge* about environmental pollution and problems in neighborhoods and *education* in the applications. (Relation of ‘Education’ (X3) with (X13) is (-4 %) in Case 2). It has been revealed that people who have high level of education may not be the people who are more interested in current environmental state in the place where they live.
- The people who have *indigenous environmental knowledge* about environmental pollution and problems in their neighborhoods have been observed to have system knowledge about ‘Reasons of Environmental Pollution and Problems’ (43%) and ‘Determination of Environmental Knowledge as True or False’ (10%) although they have no strong system knowledge about ‘Definition of Environment’ (4%) and ‘Results of Consumption of Water Resources’ (4%).

Some common results were obtained at the end of the analysis of socio-economic situations of people who have the highest score in questions on system knowledge (Questions 14, 16, 24, 25, 26), indigenous environmental knowledge (Question 15 and 20) and environmental attitude (Question 19).

According to this analysis, distribution of socio-economic status of ‘highest score’ participants on system knowledge, indigenous environmental knowledge and environmental attitude questions is given in Table 5.32.

Table 5.32. Distribution of socio-economic status of ‘highest score’ participants on system knowledge, indigenous environmental knowledge and environmental attitude questions

	EDUCATION				AGE			INCOME		
	PRIM. SCH.	SECOND. SCH.	HIGH SCH.	UNIV.	YOUNG	MIDDLE	SENIOR	BELOW 419 TL	419-1000 TL	ABOVE 1000 TL
SYSTEM KNOWLEDGE	34.9	14.7	30	18.2	7.1	88.3	3.9	20.1	44.6	32.7
INDIGENOUS ENV. KNOWLEDGE	55.3	10.7	20.9	11.5	10.2	84.6	2.6	23	53.8	21.7
ENVIRONMENTAL ATTITUDE	44.9	16.4	24.9	10.8	8	87.4	4.1	27.9	49.8	19.3

The dominant role of middle aged people who have low education and income level in group of people who have the highest score in environmental knowledge and attitude questions, can be based on the high ratios of the people who have these characteristics within general socio-economic structure of basin population.

Similar results have also been obtained by the analysis of the socio-economic characteristics of the people whose total score is higher than average score (32,8). According to the results, 44% of these people is primary school graduate. 50 % and 87 % are ratios of the people who make money between minimum wage and 1000 TL and middle aged people in this group, respectively.

The results indicating the effects of system knowledge, indigenous environmental knowledge and environmental attitude on environmental awareness of participants are in the following paragraphs:

- Question asked for determination of environmental attitude of people (Question 19) has the strongest effect on environmental awareness of people with 68 % according to correlation matrix in Case 3.
- System knowledge questions (Questions 24, 16, 25, 26, 14) are in the second place in terms of effect on environmental awareness of people just after environmental attitude questions. The ratios indicating the relations of these questions to environmental awareness of people are 58 %, 54 %, 43 %, 42 % and 35 %, respectively, according to correlation matrix in Case 3.
- The effects of indigenous environmental knowledge questions (Question 15 and 20) on environmental awareness of people are smaller than the effects of environmental attitude and system knowledge questions. The degrees of relations between these questions and total point are 37% and 24%, respectively, according to correlation matrix in Case 3.

The effectiveness of environmental attitude on environmental awareness of people can also be comprehended by comparison of sum of residuals, average residuals and

coefficient of multiple determination among three applications. As indicated above, while Case 1 is including system knowledge questions; indigenous environmental knowledge questions are added in Case 2. Case 3 was studied to show the effect of environmental attitude question on environmental awareness of the people in addition to system knowledge and indigenous environmental knowledge.

Coefficient of multiple determination (R^2) has been converted from 0.71 in Case 1 to 0.73 in Case 2 and 0.98 in Case 3. (For Case 1, 2 and 3: The values of sum of residuals are 172.34, 155.73 and 42.42 and the values of average residuals are 0.08, 8.06 and 2.14, respectively).

- The changes in sum of residuals, average residuals and coefficient of multiple determination as indicated above shows that the differences between actual data points and the curve generated from predicted values in the regression model have been decreased from Case 1 to 2 and 3 with addition of indigenous and especially environmental attitude variables to system knowledge variables. The positive contribution of these additions to the model can also be seen in the changes of the proportion of variation in the data points which is explained by the regression model with R^2 .

6. CONCLUSIONS

Küçükçekmece water body is one of the limited number of lagoons in the world and a very important water resource in Turkey. The deterioration in water quality and pollution in the Lagoon and the basin have been increasing due to unplanned urbanization, rapid population increase, uncontrolled industrialization and insufficient infrastructure.

Local people in Küçükçekmece Basin not only play a role in the formation of environmental pollution and problems in the basin but also are affected by the pollution. Hence, the local public in the basin was examined in terms of their socio-economic conditions and environmental awareness.

The results of the study have shown that the 'socio-economic structure' of basin population was as follows:

- Majority of the sample population is in middle age accompanying with low level of education and income.
- The people who have higher education level are those who have migrated to the area from different cities in Black Sea, Marmara, Mediterranean and Aegan. They came to İstanbul between 1970s and 1980s. The number of family members is in the order of 3 and 4.
- The people who have low education level are those who migrated from Central, East and South East Regions of Turkey. They have come to İstanbul after 1980s but particularly since late 1990s. The number of family members is between 5 and 10.
- While 65 % of basin population have settled down in Küçükçekmece since 1988, % 21 of the population have been living in Küçükçekmece more than 20 years.

Migration dates of Küçükçekmece basin population clearly show that exclusion of Küçükçekmece Basin from protection area between 1984 and 1997 became very effective in rapid population increase and unplanned urbanization in the Region.

The 'environmental awareness' of the population is as follows:

- 'Environment' especially consists of neighborhoods, family and friends for half of the basin population.
- The awareness of basin population for environmental pollution is based on direct effects. If local community can perceive the adverse effects of the pollution by their five senses, they perceive the influence as a 'problem'. The role of 'indigenous environmental knowledge' in the formation of environmental awareness was very important.

The 'relationship between system knowledge, indigenous environmental knowledge, environmental attitude and education' was as follows:

- A positive relation between education, system knowledge and environmental attitude exists, but it does not necessarily mean that the people have indigenous environmental knowledge.

The socio-economic properties of people who had the highest score in 'system knowledge', 'environmental attitude' and 'indigenous environmental knowledge' are as follows:

- Generally in the 'middle income', 'low education' and 'middle age' group.

Factors that affect 'environmental awareness' of the population were on the following:

- Maximum affect variable is 'environmental attitude' and it is followed by 'system knowledge' and 'indigenous environmental knowledge'.

Finally, the study has revealed that if community participation is sought for environmental management in Küçükçekmece Basin, the best alternative is selection of inhabitants with middle income, low education level and middle age population.

7. RECOMMENDATIONS

A similar study should be done in another region where natural system is protected. By comparison of the results of the studies, much more detailed information about the relationship between environmental quality in a region and level of environmental concern of people living there can be achieved.

This study has been made by only local community, settled in the Region and living there. But, local people also include the people who work in industrial facilities and other business places in the Region and the people who work in the institutions that have authority in the environmental protection of the Region. The other two groups of people should also be included by the study in order to determine environmental awareness of the people who can probably have different views, priorities and responsibilities. By this way, the differences among environmental attitudes of people and their priorities can be determined in a much more detail.

It has been observed in this study that the answers in face to face interviews are much more certain and the number of misunderstandings related to questions is less than in the method of questionnaire. That's why, face to face interviews should be preferred instead of questionnaire method although the number of the people interviewed is limited and a longer period of time is needed during face to face interviews.

If specific state, pertaining to the region about which the research is made, is mentioned during the interviews such as nuclear wastes from Nuclear Research Center in Küçükçekmece Region, it should be investigated by the experts in the related field.

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APPENDIX A: QUESTIONS ASKED IN THE INTERVIEWS WITH MUKHTAR

1. What are your responsibilities as a mukhtar?
2. How many years have you been living in this neighborhood?
3. How many people live in the neighborhood?
4. Where do neighborhood residents generally migrate from?
5. When did the settlement begin in your neighborhood?
6. What kind of characteristics make the neighborhood an attractive place for settlement?
7. How is the socio-economic situation of the neighborhood community?
8. What are the main livelihoods of the residents in the neighborhood?
9. What kind of environmental problems is apparent in your neighborhood?
10. What are the services coming from governmental authorities for environmental protection?

APPENDIX B: QUESTIONS ASKED IN FACE TO FACE INTERVIEWS

Questions Asked to Public in ‘Face to Face Interviews’

1. How long have you been living here? Where did you come from? What was the reason?
(probe: proposal, your own choice, business or terror)
2. What is your occupation? What is your salary?
3. What is your opinion about health services in your neighborhood? What do you do when you are sick? Are you able to maintain medicine?
4. What is your level of education? Is there anyone who attends the school in your family?
5. Do you have any charge in any NGO?
6. What is the main connection between you and other people around you?
(probe: migration from the same city or region, working in the same firm, residence in the same street, working in the same NGO).
7. Do you own the house you live?
(probe: you own the house / you construct it, you rent it, you have real property registration or not).
8. Is your income sufficient?
(if it is no : why?, what would you do if it was higher? how much should it be to become sufficient?).

9. Is there any working woman in your home / family?
(if yes : where does she work? what kind of businesses does she do?).
10. What is your opinion about services of the institutions which have responsibilities in your neighborhood?
(probe: municipality, IWSA, village headman).
11. What are your expectations?
12. Define environmental pollution / problems.
13. What are the environmental problems in your neighborhood?
14. Who do you think generates the environmental pollution? Do you see yourself as a contributor to the pollution? What is the contribution of industrialists on this matter?
15. Who / what institution is responsible for controlling the pollution / for cleaning the environment?
16. What are the environmental differences between today and the day you migrated here?
17. How could the region be protected? What kind of contributions do you make to the protection of your neighborhood?
18. What kind of changes do you want to see in your neighborhood?

Questions Asked to People in Industrial Facilities in 'Face to Face Interviews'

1. What are the raw materials? Where do they come from? Is it important for you whether they are exported or imported?

2. What do you produce? For and how much?
3. When did you come to the region? How many years have you been active in production?
4. Has there been any change in the amount of production since you have begun production? If yes, what is the effect of this change on the number of employee and the amount of waste produced?
5. Where is the wastewater coming from your facility discharged into?
6. Is there any treatment facility? Do you have a discharge licence? Does the wastewater comply with the discharge criteria?
7. How do you remove the wastes other than the wastewater generated in your facility?
(probe : if it is domestic (solid) : is it removed by municipality? if it is hazardous waste : do you send it to Izaydaş?)
8. What is the total amount of the waste generated?
(probe : wastewater, solid waste, hazardous waste)
9. Do you have an emission report?
10. What is the number of employees?
(probe: insured, blue colors, white colors)
11. How is the health service in your facility? Is there a doctor? What is done in case of emergency?
12. What is the number of women employees? What is their proportion to all employees? What kind of positions do they have?

13. The age of the employees
(probe : below 18, between 18-40, above 40)

14. What is the salary of the employees?
(probe: less than minimum wage (seasonal employee), minimum wage – 1500NTL, more than 1500 NTL).

15. How many days is the weekly working time? How many shifts are there?

16. What is the education level of the employees?
(probe : primary school, high school, university, Ms – PhD).

17. What is the education level of managers?
(probe : primary school, high school, university, Ms – PhD).

18. Is there any internal training? Which training programs have been applied? What was the training institution – training date – the number of employees trained?

19. Does the facility have a permanent licence? If it is temporary licence when has it been taken last? Which institution has given the licence?

20. Is there any quality document? When was it taken? Who gave it?

21. What is/are environmental pollution / problems?

22. What are the environmental problems in your neighborhood?

23. Who do you think is responsible for the environmental pollution? Do you see yourself as a contributor to the pollution?

24. Who / what institution is responsible for control of environmental pollution / for cleaning the environment? What is your position in such a situation?

25. What are the environmental differences between today and the day you came here?
26. How could be the region protected? What kind of contributions do you make to the protection of the neighborhood?
27. What kind of changes do you want to see in your neighborhood?

APPENDIX C: QUESTIONNAIRE BASED ON OPEN ENDED QUESTIONS

1. Your Gender
 - a) Female
 - b) Male

2. How old are you?

3. What is your occupation?

4. What is your education?
 - a) Illiterate
 - b) Primary school
 - c) Secondary school
 - d) High school
 - e) University

5. What is your monthly income?
 - a) 500 YTL or below
 - b) Between 500-1000 YTL
 - c) 1000 YTL or above

6. Where did you come from to İstanbul?

7. What was your reason for coming to İstanbul?
 - a) Terror
 - b) Unemployment
 - c) The existence of relatives in İstanbul
 - d) Due to the business of wife or husband
 - e) Reducing share of land because of high number of brothers
 - f) Children living in İstanbul

8. When did you come to İstanbul?
9. How long have you been living in Küçükçekmece Region?
10. Why did you choose Küçükçekmece Region?
11. How long have you been living in your neighborhood?
12. What is environment in your opinion?
13. What are the environmental pollution and other environmental problems disturbing you in your neighborhood?
14. What are the reasons of these pollution and problems in your opinion?
15. Who are the polluters polluting your surrounding in your opinion?
16. Who is responsible for prevention of these pollution and problems in your opinion?
17. Is there any action you have committed which made you feel regret because it affects the neighborhood where you live in a negative way?
18. What is your opinion about Küçükçekmece Lake?
19. What are the differences in your neighborhood between your coming date and today?

APPENDIX D: QUESTIONNAIRE BASED ON CLOSED ENDED QUESTIONS

1. Name - Surname

2. Your Gender

a) Female b) Male

3. How old are you?

**a) 20 and below b) Between 21-30 c) Between 31-40 d) Between 41-50
e) Between 51-60 f) 61 and above**

4. What is your education?

**a) Illiterate b) Primary school graduate c) Secondary school graduate
d) High school graduate e) University graduate**

5. What is your occupation?

**a) Unemployed b) Employee c) Tradesman d) State official e) Housewife
f) Free work (Please write down **)

6. What is your monthly income?

**a) None b) Minimum wage or below c) Between minimum wage – 700 YTL
d) Between 700 – 1000 YTL e) Between 1000 – 2000 YTL f) Above 2000 YTL**

7. What is the number of home residents?

a) 2 or less b) 3 – 4 c) 5 – 10 d) More than 10

8. Where is your hometown?**9. What is your reason for coming to İstanbul?**

- a) Born in İstanbul
- b) Teror
- c) Unemployment
- d) The existence of relatives in İstanbul
- e) Due to business of wife or husband
- f) Reducing share of land because of high number of br others
- g) Due to appointment
- h) Other (Please write down)

10. When did you come to İstanbul?

- a) Born in İstanbul
- b) Between 1950-1970
- c) Between 1971-75
- d) Between 1976-80
- e) Between 1981-85
- f) Between 1986-90
- g) Between 1991-95
- h) Between 1996-2000
- i) 2001 and after

11. How long have you been living in Küçükçekmece Region?**12. Why did you choose Küçükçekmece Region?**

- a) Existence of relatives, friends ... etc.
- b) Due to natural beauties (existence of Lake, beauty of nature)
- c) Business opportunity, existence of industry
- d) Existence of suitable conditions which make easier construction of buildings

- e) In order to live the life in hometown
- f) Cheap houses and lands
- g) Due to house provided by the business place
- h) Other (Please write down

13. What neighborhood have you been living?(Please check)

Altınşehir	Atakent	Atatürk	Başahşehir
Fevzi Çakmak	Güvercin-tepe	Gültepe	Halkalı Merkez
Kayabaşı	Kemalpaşa	Mehmet Akif	Söğütlüçeşme
Yarımburgaz	Yenimahalle	Yeşilova	Ziyagökalp
Beşyol	Cennet	Cumhuriyet	Fatih
İnönü	İstasyon	Kanarya	Kartal-tepe
Sultan Murat	Samlar Köyü	Şahintepe	Tevfikbey

14. What is the most accurate definition of environment in your opinion?

- a) Neighbors, friends, family, people in surroundings
- b) Residential area, neighborhood, land (location)
- c) Nature
- d) The place where all living such as people, animal, plants and nonliving elements exist and interact each other

NOTE: You can check more than one choice in questions of 15,16 and 17

15. What are the environmental pollutions and problems disturbing you in the neighborhood you live?

- a) Air pollution b) Waste waters c) Noise pollution d) Odor e) Visual pollution
- f) Nuclear wastes g) Garbage (Solid waste)

16. What is the reasons of environmental pollution and problems in general sense in your opinion?

- a) Factory/industry b) Traffic c) Insufficient infrastructure d) Unplanned urbanization
e) Misuse of nature f) Global effects g) Misuse of natural resources

17. Who is responsible for prevention of environmental pollution and problems?

- a) Municipality b) IWSA c) Ministry of Environment and Forestry d) People e) Media
f) Educators

18. How is your sensitivity to environment?

- a) Very sensitive
b) Sensitive
c) From time to time
d) None

19. Write down one of the responses below next to the choices indicated below

Regret	No regret	None at all
--------	-----------	-------------

- a) Throwing garbage
b) Making disturbing noise (high volume of music, shouting)
c) Not to warn the people polluting the environment
d) Burning plastic, fabric ...etc.
e) Spitting
f) Throwing smoke into the floor
g) Cutting trees

20. Check your opinion about Küçükçekmece Lake and write down the reason for thinking in this way.

- a) Polluted day by day b) Clean c) No idea d) Disinterested

21. Do you eat fish caught in Küçükçekmece Lake

a) Yes b) No

22. Do you swim in Küçükçekmece Lake?

a) Yes b) No

23. What benefits do you expect from Küçükçekmece Lake? (you can check more than one choice)

a) Fishing

b) Swimming

c) Water sports (sailing, surfing)

d) Use surrounding of the Lake for social purposes (picnic, walking... etc)

e) Use as drinking water

24. For each choice check correct or false.

a) Illegal urbanization increase environmental problems (C / F)

b) Discharge of waste water into lake, river, sea does not cause environmental pollution (C / F)

c) Throwing garbage and smoke into the floor does not cause environmental pollution (C / F)

d) There is no relationship between climate change and global warming (C / F)

e) Saving water provides protection of water resources (C / F)

f) Maintenance energy with nuclear station does not harm to the environment (C / F)

g) Maintenance energy through the sources such as sun, wind does not harm to the environment (C / F)

h) Direct discharge of industrial wastes without treatment does not harm to the environment (C / F)

i) Reuse of wastes decrease consumption of natural resources (C / F)

25. What are results of the consumption of clean water resources? Please write it down.

26. What are the reasons of pollution in the natural water resources (lake, river ...etc.) in your opinion?

NOTE: Check only 1 choice in questions 27 and 28

27. Which institution is responsible for construction of sewage system and taking away waste water?

- a) Village headman
- b) IWSA
- c) Municipality
- d) Ministry of Environment and Forestry
- e) Other (please write down).

28. Which institution is responsible for collection of garbages?

- a) Village headman
- b) IWSA
- c) Municipality
- d) Ministry of Environment and Forestry
- e) Other (please write down)

29. Which institution inspects whether industrial facilities harm to the environment or not? (You can check more than one choices).

- a) Village headman
- b) IWSA
- c) Municipality
- d) Ministry of Environment and Forestry
- e) Other (please write down)

30. If you get extra income out of your Standard, would you spend for protection of the environment?

- a) Yes, I spend (Please write down what you spend for)

b) No, I don't (Please write down your reason.....)

Thanks for responding the questions.

**APPENDIX E: SCORES OBTAINED ACCORDING TO THE
ANSWERS IN QUESTIONNAIRE BASED ON CLOSED ENDED
QUESTIONS**

The points which were given to each choice are as follows:

Question 14 What is the most accurate definition of environment in your opinion?

- a) Neighbors, friends, family, people in surroundings: 1 point
- b) Residential area, neighborhood, land (location): 2 point
- c) Nature: 3 point
- d) The place where all living such as people, animal, plants and nonliving elements exist and interact each other: 4 point

Blank: 0 point

Question 15 What are the environmental pollutions and problems disturbing you in the neighborhood you live?

Each choice 1 point

Blank: 0 point

Question 16 What is the reasons of environmental pollution and problems in general sense in your opinion?

Each choice 1 point

Blank: 0 point

Question 17. Who is responsible for prevention of environmental pollution and problems?

Each choice 1 point

Blank: 0 point

Question 18. How is your sensitivity to environment?

- a) Very sensitive: 4 points
- b) Sensitive: 3 points
- c) From time to time: 2 points
- d) None: 1 point
- Blank: 0 point

Question 19. Write down one of the responses below next to the choices indicated below

Regret	No regret	Never
--------	-----------	-------

- a) Throwing garbage
- b) Making disturbing noise (high volume of music, shouting)
- c) Not to warn the people polluting the environment
- d) Burning plastic, fabric ...etc.
- e) Spitting
- f) Throwing smoke into the floor
- g) Cutting trees

For each choice: Regret: 1 point, No regret: -1 point, None at all: 2 points.

Blank: 0 point

Question 20. Check your opinion about Küçükçekmece Lake and write down the reason for thinking in this way.

- a) Polluted day by day: 1 point
- b) Clean: - 1 point
- c) No idea: 0 point
- d) Disinterested: 0 point
- Blank: 0 point

21. Do you eat fish caught in Küçükçekmece Lake

- a) Yes: -1 point

b) No:1 point

Blank: 0 point

22. Dou you swim in Küçükçekmece Lake?

a) Yes: -1 point

b) No:1 point

Blank: 0 point

Question 24. For each choice check one of the boxes as correct or false

a) Illegal urbanization increase environmental problems.....

Correct: 1 point False: -1 point Blank: 0 point

b) Discharge of wastewater into lake, river, sea does not cause environmental pollution...

Correct: -1 point False: 1 point Blank: 0 point

c) Throwing garbage and smoke into the flor does not cause environmental pollution...

Correct: -1 point False: 1 point Blank: 0 point

d) There is no relationship between climate change and global warming.....

Correct: -1 point False: 1 point Blank: 0 point

e) Saving water provides protection of water resources

Correct: 1 point False: -1 point Blank: 0 point

f) Maintenance energy with nuclear station does not harm to the environment.....

Correct: -1 point False: 1 point Blank: 0 point

g) Maintenance energy through the sources such as sun, wind does not harm to the env....

Correct: 1 point False: -1 point Blank: 0 point

h) Direct discharge of industrial wastes without treatment does not harm to the env....

Correct: -1 point False: 1 point Blank: 0 point

i) Reuse of wastes decrease consumption of natural resourdes

Correct: 1 point False: -1 point Blank: 0 point

Question 25. What are results of the consumption of clean water resources? Please write it down

Each keyword: 1 point

Disinterested responds: -1 point

Blank: 0 point

Question 26. What are the reasons of pollution in the natural water resources (lake, river ...etc.) in your opinion?

Each keyword: 1 point

Disinterested responds: -1 point

Blank: 0 point

Question 27. Which institution is responsible for construction of sewage system and taking away waste water?

- a) Village headman: -1 point
- b) IWSA: 1 point
- c) Municipality: -1 point
- d) Ministry of Environment and Forestry: -1 point
- e) Other (please write down) : -1 point

Blank: 0 point

Question 28. Which institution is responsible for collection of garbages?

- a) Village headman: -1 point
- b) IWSA: -1 point
- c) Municipality: 1 point
- d) Ministry of Environment and Forestry: -1 point
- e) Other (please write down): -1 point

Question 29. Which institution inspects whether industrial facilities harm to the environment or not? (You can check more than one choices).

- a) Village headman: -1 point

- b) IWSA: 1 point**
- c) Municipality: 1 point**
- d) Ministry of Environment and Forestry: 1 point**
- e) Other (please write down) : -1 point**

APPENDIX F: TABLE OF REGRESSION ANALYSIS IN CASE 1

DataFit version 9.0.59

Equation ID: a*x1+b*x2+c*x3+d*x4+e*x5+f*x6+g*x7+h*x8+i*x9+j*x10+k*x11+l*x12+m*x13+n*x14+o*x15+p*x16+q*x17+r*x18+s*x19

Model Definition:

Y = a*x1+b*x2+c*x3+d*x4+e*x5+f*x6+g*x7+h*x8+i*x9+j*x10+k*x11+l*x12+m*x13+n*x14+o*x15+p*x16+q*x17+r*x18+s*x19

Number of observations = 1930

Number of missing observations = 489

Solver type: Nonlinear

Nonlinear iteration limit = 250

Diverging nonlinear iteration limit =10

Number of nonlinear iterations performed = 1

Residual tolerance = 0.0000000001

Sum of Residuals = 172.34903489379

Average Residual = 0.089300018079684

Residual Sum of Squares (Absolute) = 38407.413187262

Residual Sum of Squares (Relative) = 38407.413187262

Standard Error of the Estimate = 4.48308718871647

Coefficient of Multiple Determination (R^2) = 0.7189760811

Proportion of Variance Explained = 71.89760811%

Adjusted coefficient of multiple determination (Ra^2) = 0.716329074

Durbin-Watson statistic = 1.93010938164124

Regression Variable Results

Variable	Value	Standard Error	t-ratio	Prob(t)
a	-0.83481489402214	0.230306208571653	-3.624804121	0.0003
b	0.625117663947003	0.14069011439799	4.443223795	0.00001
c	0.342655786585905	0.106961441522288	3.203544957	0.00138
d	8.64804378640357E-02	8.25251284412862E-02	1.047928546	0.2948
e	0.350128037730308	0.177756854937173	1.969702028	0.04902
f	4.20845588421381E-02	4.16329795299676E-02	1.010846673	0.31222
g	6.78250236503805E-02	5.81729208692863E-02	1.16592089	0.24379
h	0.14054712822934	5.02919834009644E-02	2.794622895	0.00525
i	0.984621039084845	0.147392980541694	6.680243764	0.0
j	9.90441838495436E-02	0.040268585644019	2.459589337	0.014
k	0.152703543761514	6.07527990504472E-02	2.51352277	0.01203
l	1.09999280161068	7.84248199013985E-02	14.02608005	0.0
m	1.39287135727028	8.12904100455533E-02	17.13451017	0.0
n	1.35634852153369	9.40792141141972E-02	14.41709026	0.0
o	2.06507003943306	0.127092250111371	16.24859138	0.0
p	1.31340015794857	4.57542351285826E-02	28.70554287	0.0
q	1.29670021459952	9.55526058548077E-02	13.57053743	0.0
r	1.87242609628014	0.15187333816506	12.3288664	0.0
s	1.14894346008016	0.116689521010954	9.846157994	0.0

68% Confidence Intervals

Variable	Value	68% (+/-)	Lower Limit	Upper Limit
a	-0.83481489402214	0.229085585666224	-1.06390047968836	-0.605729308355916
b	0.625117663947003	0.139944456791681	0.485173207155321	0.765062120738684
c	0.342655786585905	0.10639454588222	0.236261240703686	0.449050332468125

d	8.64804378640357E-02	8.20877452605473E-02	4.39269260348836E-03	0.168568183124583
e	0.350128037730308	0.176814743606006	0.173313294124302	0.526942781336314
f	4.20845588421381E-02	4.14123247384588E-02	6.72234103679364E-04	8.34968835805969E-02
g	6.78250236503805E-02	5.78646043886791E-02	9.96041926170138E-03	0.12568962803906
h	0.14054712822934	5.00254358889393E-02	9.05216923404007E-02	0.190572564118279
i	0.984621039084845	0.146611797744823	0.838009241340023	1.13123283682967
j	9.90441838495436E-02	4.00551621401057E-02	5.89890217094379E-02	0.139099345989649
k	0.152703543761514	6.04308092154799E-02	9.22727345460338E-02	0.213134352976994
l	1.09999280161068	7.80091683559211E-02	1.02198363325475	1.1780019699666
m	1.39287135727028	8.08595708723119E-02	1.31201178639796	1.47373092814259
n	1.35634852153369	9.35805942793919E-02	1.2627679272543	1.44992911581308
o	2.06507003943306	0.126418661185781	1.93865137824728	2.19148870061884
p	1.31340015794857	4.55117376824011E-02	1.26788842026617	1.35891189563097
q	1.29670021459952	9.50461770437772E-02	1.20165403755575	1.3917463916433
r	1.87242609628014	0.151068409472786	1.72135768680735	2.02349450575292
s	1.14894346008016	0.116071066549596	1.03287239353056	1.26501452662975

90% Confidence Intervals

Variable	Value	90% (+/-)	Lower Limit	Upper Limit
a	-0.83481489402214	0.37901492744637	-1.21382982146851	-0.45579996657577
b	0.625117663947003	0.231533721264773	0.39358394268223	0.856651385211775
c	0.342655786585905	0.176026444313229	0.166629342272676	0.518682230899135
d	8.64804378640357E-02	0.135811603875825	-4.93311660117889E-02	0.22229204173986
e	0.350128037730308	0.292534456170106	5.75935815602021E-02	0.642662493900414
f	4.20845588421381E-02	6.85153944124676E-02	-2.64308355703295E-02	0.110599953254606
g	6.78250236503805E-02	9.57351758745845E-02	-0.027910152224204	0.163560199524965
h	0.14054712822934	8.27655170829671E-02	5.77816111463729E-02	0.223312645312307
i	0.984621039084845	0.242564628077466	0.74205641100738	1.22718566716231
j	9.90441838495436E-02	6.62700113943621E-02	3.27741724551815E-02	0.165314195243906
k	0.152703543761514	0.099980881397321	5.27226623641927E-02	0.252684425158835
l	1.09999280161068	0.129063726111732	0.970929075498944	1.22905652772241
m	1.39287135727028	0.133779627811967	1.25909172945831	1.52665098508224
n	1.35634852153369	0.154826162667734	1.20152235886596	1.51117468420143
o	2.06507003943306	0.209155716008284	1.85591432342478	2.27422575544135
p	1.31340015794857	7.52977447511083E-02	1.23810241319746	1.38869790269968
q	1.29670021459952	0.157250923455257	1.13944929114427	1.45395113805478
r	1.87242609628014	0.24993795261824	1.6224881436619	2.12236404889838
s	1.14894346008016	0.192035944727728	0.95690751535243	1.34097940480789

95% Confidence Intervals

Variable	Value	95% (+/-)	Lower Limit	Upper Limit
a	-0.83481489402214	0.451676536250726	-1.28649143027287	-0.383138357771413
b	0.625117663947003	0.275921452357339	0.349196211589664	0.901039116304341
c	0.342655786585905	0.209772779113511	0.132883007472395	0.552428565699416
d	8.64804378640357E-02	0.16184828189905	-7.53678440350147E-02	0.248328719763086
e	0.350128037730308	0.348616743902784	1.51129382752402E-03	0.698744781633092
f	4.20845588421381E-02	8.16505994541724E-02	-3.95660406120343E-02	0.123735158296311
g	6.78250236503805E-02	0.114088732408844	-4.62637087584639E-02	0.181913756059225
h	0.14054712822934	9.86326378459714E-02	4.19144903833686E-02	0.239179766075311
i	0.984621039084845	0.28906711343837	0.695553925646475	1.27368815252322

j	9.90441838495436E-02	7.89747501650501E-02	2.00694336844935E-02	0.178018934014594
k	0.152703543761514	0.119148389497737	3.35551542637766E-02	0.271851933259251
l	1.09999280161068	0.153806756790623	0.946186044820052	1.2537995584013
m	1.39287135727028	0.159426752181339	1.23344460508894	1.55229810945161
n	1.35634852153369	0.184508154720763	1.17184036681293	1.54085667625445
o	2.06507003943306	0.249253320918422	1.81581671851464	2.31432336035148
p	1.31340015794857	8.97332059341761E-02	1.22366695201439	1.40313336388274
q	1.29670021459952	0.187397770602449	1.10930244399708	1.48409798520197
r	1.87242609628014	0.297853990809316	1.57457210547082	2.17028008708946
s	1.14894346008016	0.228851488606684	0.920091971473474	1.37779494868684

99% Confidence Intervals

Variable	Value	99% (+/-)	Lower Limit	Upper Limit
a	-0.83481489402214	0.593821528181151	-1.42863642220329	-0.240993365840989
b	0.625117663947003	0.362755390963779	0.262362272983224	0.987873054910781
c	0.342655786585905	0.275789380821067	6.68664057648386E-02	0.618445167406972
d	8.64804378640357E-02	0.212782791173012	-0.126302353308976	0.299263229037048
e	0.350128037730308	0.458328274770007	-0.108200237039699	0.808456312500315
f	4.20845588421381E-02	0.107346474420068	-6.52619155779303E-02	0.149431033262207
g	6.78250236503805E-02	0.149993059169368	-8.21680355189874E-02	0.217818082819748
h	0.14054712822934	0.129672850001047	1.08742782282934E-02	0.270219978230387
i	0.984621039084845	0.380038061028703	0.604582978056142	1.36465910011355
j	9.90441838495436E-02	0.103828521224539	-4.78433737499505E-03	0.202872705074082
k	0.152703543761514	0.156645017071673	-3.94147331015945E-03	0.309348560833187
l	1.09999280161068	0.202210555633766	0.897782245976909	1.30220335724444
m	1.39287135727028	0.209599193261455	1.18327216400882	1.60247055053173
n	1.35634852153369	0.242573845672046	1.11377467586165	1.59892236720574
o	2.06507003943306	0.32769465768716	1.7373753817459	2.39276469712022
p	1.31340015794857	0.117972719855537	1.19542743809303	1.4313728778041
q	1.29670021459952	0.246372838936036	1.05032737566349	1.54307305353556
r	1.87242609628014	0.391590215124792	1.48083588115535	2.26401631140493
s	1.14894346008016	0.300872260974645	0.848071199105513	1.4498157210548

Variance Analysis

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob(F)
Regression	18	98262.1391443443	5459.00773024135	271.6184951	0
Error	1911	38407.413187262	20.0980707416337		
Total	1929	136669.552331606			

APPENDIX G: CORRELATION MATRIX IN CASE 1

Correlation matrix

X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	Y
X1	1	0.284673557	0.086009634	0.286132971	0.110011559	0.024674282	0.186258986	0.042435793	0.045939711	-0.065354196	-0.002781217	-0.007070607	-0.037567923	-0.022034985	-0.00392101	-0.035031049	-0.035915656	0.047728831	-0.082466163
X2	0.284673557	1	0.013012224	0.147946976	0.06517454	0.031071522	0.089633357	-0.101857194	0.095579134	0.02283004	0.040598823	0.032192413	0.051481674	0.052706976	0.049938851	0.038862988	0.045645623	0.037002323	0.083213679
X3	0.086009634	0.013012224	1	0.358923594	-0.198435708	0.016718559	-0.281095328	-0.100202345	-0.060156806	0.174019903	-0.05624534	0.180047393	0.179379392	0.162027343	0.169932298	0.127659738	0.113762368	0.045510223	0.240363194
X4	0.286132971	0.147946976	0.358923594	1	-0.077868828	0.01269823	-0.097453553	-0.069296849	-0.009240339	0.069425474	-0.013798412	0.099771576	0.077731373	0.046903084	0.068726122	0.083719519	0.039682215	0.007731211	0.034346722
X5	0.110011559	0.06517454	-0.198435708	-0.077868828	1	0.120139273	0.182721105	0.154932691	-0.06471693	-0.044056114	0.018223903	-0.046068741	-0.106350631	-0.080639072	-0.048727296	-0.069474269	-0.053509241	-0.025959905	-0.146977785
X6	0.024674282	0.031071522	0.016718559	0.01280623	0.120139273	1	-0.18007193	0.084117366	-0.025745935	-0.015901447	0.03944042	0.005664498	-0.004406214	-0.013788252	0.012669331	-0.009878516	-0.051780725	-0.033523929	-0.017883253
X7	0.186258986	0.089633357	-0.281095328	-0.097453553	0.182721105	-0.18007193	1	0.500132316	-0.150701364	-0.162974395	-0.030836601	-0.098991709	-0.102126727	-0.127714761	-0.030418859	-0.10522698	-0.069578409	-0.045120183	-0.153683709
X8	0.042435793	-0.101857194	-0.100202345	-0.069296849	0.154932691	0.084117366	0.500132316	1	-0.48283236	-0.113237257	-0.060343662	-0.060373432	-0.093677034	-0.133540592	-0.030027737	-0.09774622	-0.034551332	-0.027940189	-0.148659879
X9	0.045939711	0.095579134	-0.060156806	-0.009240339	-0.06471693	-0.025745935	-0.150701364	-0.48283236	1	-0.126629602	0.078717158	0.015397169	0.037857904	-0.00400928	0.064032814	0.021702426	0.001253374	0.067984108	0.086715418
X10	-0.065354196	0.02283004	0.174019903	0.060425474	-0.044056114	-0.015901447	-0.162974395	-0.113237257	-0.126629602	1	0.19501259	0.080687416	0.121679358	0.059690956	0.080717593	0.075980209	0.070475189	-0.021347414	0.141020216
X11	-0.002781217	0.040598823	-0.05624534	-0.013798412	0.018223903	0.03944042	-0.030836601	-0.060343662	0.078717158	0.19501259	1	0.020303192	-0.001614666	0.007099245	0.01668556	-0.010749881	0.01251433	0.037495227	0.060670394
X12	-0.007070607	0.072508938	0.180047393	0.099771576	-0.046068741	0.005664498	-0.098991709	-0.060373432	0.015397169	0.080687416	0.020303192	1	0.188349417	0.159224256	0.081338187	0.120598433	0.089641854	0.106409877	0.049115944
X13	-0.037567923	0.032192413	0.179379392	0.077731373	-0.106350631	-0.004406214	-0.102126727	-0.093677034	0.037857904	0.121679358	-0.001614666	0.188349417	1	0.486271271	0.138355986	0.231095607	0.174560774	0.16393561	0.032690773
X14	-0.052203191	0.051481674	0.182047198	0.046903084	-0.080639072	-0.013788252	-0.127714761	-0.133540592	0.035013786	0.104607726	0.007099245	0.159242456	0.486271271	1	0.134357558	0.215147335	0.192199046	0.179314029	0.01958517
X15	-0.022034985	0.052706976	0.162027343	0.083719519	0.089726122	-0.048727296	0.012669331	-0.030418859	-0.030027737	-0.00400928	0.059690956	0.01668556	0.01338187	0.138355986	1	0.134357558	0.077214304	0.100645963	0.008930935
X16	-0.00392101	0.049938851	0.169932298	0.083719519	-0.077445638	0.083719519	-0.051780725	-0.10522698	-0.09774622	0.064032814	0.080717593	0.120598433	0.231095607	0.15147335	0.063445809	1	0.254651016	0.235724481	0.093907572
X17	-0.035031049	0.038862988	0.127659738	0.039682215	-0.069474269	-0.051780725	-0.069578409	-0.034551332	0.021702426	0.075980209	0.01251433	0.089641854	0.174560774	0.192199046	0.077214304	0.192199046	1	0.254651016	0.034169492
X18	-0.035915656	0.045645623	0.045510223	0.007731211	-0.053509241	-0.033523929	-0.045120183	-0.027940189	0.007263374	-0.070475189	0.037495227	0.106409877	0.16393561	0.179314029	0.100645963	0.235724481	0.254651016	1	0.091322299
X19	0.04728831	0.037002323	0.045510223	0.034346722	-0.025959905	-0.017883253	-0.028451666	-0.069117308	0.067984108	-0.021347414	0.060670394	0.049115944	0.032690773	0.01958517	0.008930935	0.063907572	0.034169492	0.091322299	1
Y	-0.082466163	0.083213679	0.240363194	0.066413624	-0.146977785	-0.17883253	-0.153683709	-0.149859879	0.086715418	0.141020216	0.03868699	0.349566304	0.545308069	0.516084011	0.288771064	0.58048233	0.436604089	0.420580106	0.198703983

Variance Inflation Factors

Variable	R2	VIF
X1	0.204225553	1.259637486
X2	0.129635157	1.148843467
X3	0.271602303	1.384279054
X4	0.209352237	1.26478572
X5	0.095576963	1.105677276
X6	0.034934006	1.036198567
X7	0.362120179	1.567693423
X8	0.45256427	1.826698451
X9	0.287402383	1.403316508
X10	0.095854094	1.10616106
X11	0.020898737	1.021344817
X12	0.076626512	1.082985393
X13	0.278752807	1.396487198
X14	0.27726156	1.383694709
X15	0.044646892	1.046733392
X16	0.149190404	1.175351106
X17	0.144264222	1.168895007
X18	0.140418682	1.163357337
X19	0.027733024	1.028524083

APPENDIX H: TABLE OF REGRESSION ANALYSIS IN CASE 2

DataFit version 9.0.59
 Equation ID: a*x1+b*x2+c*x3+d*x4+e*x5+f*x6+g*x7+h*x8+i*x9+j*x10+k*x11+l*x12+m*x13+n*x14+o*x15+p*x16+q*x17+r*x18+s*x19+t*x20
 Model Definition:
 $Y = a*x1+b*x2+c*x3+d*x4+e*x5+f*x6+g*x7+h*x8+i*x9+j*x10+k*x11+l*x12+m*x13+n*x14+o*x15+p*x16+q*x17+r*x18+s*x19+t*x20$

Number of observations = 1930
 Number of missing observations = 489
 Solver type: Nonlinear
 Nonlinear iteration limit = 250
 Diverging nonlinear iteration limit =10
 Number of nonlinear iterations performed = 3
 Residual tolerance = 0.000000001
 Sum of Residuals = 155.732718199437
 Average Residual = 8.06905275644752E-02
 Residual Sum of Squares (Absolute) = 36551.6084770982
 Residual Sum of Squares (Relative) = 36551.6084770982
 Standard Error of the Estimate = 4.37458201306784
 Coefficient of Multiple Determination (R^2) = 0.7325548533
 Proportion of Variance Explained = 73.25548533%
 Adjusted coefficient of multiple determination (Ra^2) = 0.7298944042
 Durbin-Watson statistic = 1.98103624070923

Regression Variable Results

Variable	Value	Standard Error	t-ratio	Prob(t)
a	-0.900366353905087	0.224850556340989	-4.004287864	0.00006
b	0.68135125259001	0.137373022180044	4.959862146	0.0
c	0.446191118417319	0.10461339401076	4.265143318	0.00002
d	0.149211045973395	8.08173941209604E-02	1.846273907	0.06501
e	0.201974446558191	0.173865052940422	1.161673626	0.24551
f	3.59856083845791E-02	4.06227900906244E-02	0.885847779	0.37581
g	2.62882606894093E-02	5.68744527884777E-02	0.462215624	0.64398
h	0.129327955481348	4.91827906726013E-02	2.629536749	0.00862
i	0.838517707124672	0.144395345907724	5.807096495	0.0
j	9.94636999781591E-02	3.93305628071278E-02	2.528916265	0.01152
k	0.132054041896099	0.059316554044951	2.226259499	0.02611
l	1.11380918709058	0.076671450873042	14.52703939	0.0
m	1.0364489394206	8.34103547423116E-02	12.42590255	0.0
n	0.994754498052574	0.084843881811607	11.72452836	0.0
o	1.1725755970704	9.28069603163743E-02	12.63456526	0.0
p	1.87023630673677	0.124728077339237	14.99450923	0.0
q	1.31783396740116	4.45902117502179E-02	29.55433302	0.0
r	1.30643510749473	9.35631213196401E-02	13.96314156	0.0
s	1.89244011442982	0.148078267240884	12.77999905	0.0
t	0.909856903899469	0.167951183777111	5.41738905	0.0

68% Confidence Intervals

Variable	Value	68% (+/-)	Lower Limit	Upper Limit
a	-0.900366353905087	0.223658848392382	-1.12402520229747	-0.676707505512705
b	0.68135125259001	0.13664494516249	0.54470630742752	0.817996197752499

c	0.446191118417319	0.104058943022503	0.342132175394816	0.550250061439822
d	0.149211045973395	8.03890619321193E-02	6.88219840412756E-02	0.229600107905514
e	0.201974446558191	0.172943568159838	2.90308783983532E-02	0.37491801471803
f	3.59856083845791E-02	4.04074893031441E-02	-4.42188091856496E-03	7.63930976877232E-02
g	2.62882606894093E-02	5.65730181886987E-02	-3.02847574992895E-02	0.082861278878108
h	0.129327955481348	4.89221218820366E-02	8.04058335993112E-02	0.178250077363384
i	0.838517707124672	0.143630050574413	0.694887656550259	0.982147757699085
j	9.94636999781591E-02	0.03912211082425	0.060341589153909	0.138585810802409
k	0.132054041896099	5.90021763085127E-02	0.073051865587586	0.191056218204611
l	1.11380918709058	7.62650921834149E-02	1.03754409490716	1.19007427927399
m	1.0364489394206	8.29682798621774E-02	0.953480659558425	1.11941721928278
n	0.994754498052574	8.43942092380055E-02	0.910360288814568	1.07914870729058
o	1.1725755970704	9.23150834266975E-02	1.08026051364371	1.2648906804971
p	1.87023630673677	0.12406701852934	1.74616928820743	1.99430332526611
q	1.31783396740116	4.43538836279417E-02	1.27348008377322	1.3621878510291
r	1.30643510749473	9.30672367766461E-02	1.21336787071808	1.39950234427138
s	1.89244011442982	0.147293452424507	1.74514666200531	2.03973356685433
t	0.909856903899469	0.167061042503092	0.742795861396377	1.07691794640256

90% Confidence Intervals

Variable	Value	90% (+/-)	Lower Limit	Upper Limit
a	-0.900366353905087	0.370036650570366	-1.27040291447545	-0.530329793334721
b	0.68135125259001	0.226074782601698	0.455276469988312	0.907426035191708
c	0.446191118417319	0.172162262523508	0.274028855893811	0.618353380940827
d	0.149211045973395	0.133001185504865	1.62098604685303E-02	0.282212231478259
e	0.201974446558191	0.286129717624053	-8.41552710658618E-02	0.488104164182245
f	3.59856083845791E-02	6.68529256521405E-02	-3.08673172675614E-02	0.10283853403672
g	2.62882606894093E-02	9.35982869539977E-02	-6.73100262645885E-02	0.119886547643407
h	0.129327955481348	0.0809401186099	4.83878368714477E-02	0.210268074091248
i	0.838517707124672	0.237631420760341	0.600886286364331	1.07614912788501
j	9.94636999781591E-02	6.47263072116902E-02	3.47373927664689E-02	0.164190007189849
k	0.132054041896099	9.76172529917758E-02	0.034436788904323	0.229671294887875
l	1.11380918709058	0.126178206701765	0.987630980388812	1.23998739379234
m	1.0364489394206	0.137268420799422	0.89918051862118	1.17371736022002
n	0.994754498052574	0.139627576297362	0.855126921755212	1.13438207434994
o	1.1725755970704	0.152732414592657	1.01984318247775	1.32530801166306
p	1.87023630673677	0.205264996877183	1.66497130985959	2.07550130361396
q	1.31783396740116	7.33821114773336E-02	1.24445185592383	1.39121607887849
r	1.30643510749473	0.153976828755732	1.152458278739	1.46041193625046
s	1.89244011442982	0.243692404398322	1.6487477100315	2.13613251882814
t	0.909856903899469	0.276397263141991	0.633459640757478	1.18625416704146

95% Confidence Intervals

Variable	Value	95% (+/-)	Lower Limit	Upper Limit
a	-0.900366353905087	0.440976911095948	-1.34134326500103	-0.459389442809139
b	0.68135125259001	0.269415971099502	0.411935281490508	0.950767223689512
c	0.446191118417319	0.205167788333903	0.241023330083416	0.651358906751222
d	0.149211045973395	0.158499073350027	-9.28802737663265E-03	0.307710119323422

e	0.201974446558191	0.340984141826757	-0.139009695268565	0.542958588384948
f	3.59856083845791E-02	7.96694159257325E-02	-4.36838075411534E-02	0.115655024310312
g	2.62882606894093E-02	0.111542176808762	-8.52539161193532E-02	0.137830437498172
h	0.129327955481348	9.64572890671058E-02	0.032870666414242	0.225785244548454
i	0.838517707124672	0.283188152394228	0.555329554730444	1.1217058595189
j	9.94636999781591E-02	0.077135099777339	0.02232860020082	0.176598799755498
k	0.132054041896099	0.116331625792958	1.57224161031409E-02	0.248385667689057
l	1.11380918709058	0.15036804945221	0.963441137638367	1.26417723654279
m	1.0364489394206	0.163584387720622	0.872864551699981	1.20003332714122
n	0.994754498052574	0.166395821008924	0.82835867704365	1.1611503190615
o	1.1725755970704	0.182013010572473	0.99056258649793	1.35458860764288
p	1.87023630673677	0.244616705277713	1.62561960145906	2.11485301201449
q	1.31783396740116	8.74503232845273E-02	1.23038364411663	1.40528429068569
r	1.30643510749473	0.183495993532078	1.12293911396265	1.48993110102681
s	1.89244011442982	0.290411097712821	1.602029016717	2.18285121214264
t	0.909856903899469	0.32938586162367	0.580471042275799	1.23924276552314

99% Confidence Intervals

Variable	Value	99% (+/-)	Lower Limit	Upper Limit
a	-0.900366353905087	0.579754674469606	-1.48012102837469	-0.320611679435481
b	0.68135125259001	0.354202600389025	0.327148652200985	1.03555385297903
c	0.446191118417319	0.269735175117344	0.176455943299975	0.715926293534663
d	0.149211045973395	0.208379569001484	-5.91685230280894E-02	0.357590614974879
e	0.201974446558191	0.448293652501585	-0.246319205943394	0.650268099059777
f	3.59856083845791E-02	0.104741801969666	-6.87561935850868E-02	0.140727410354245
g	2.62882606894093E-02	0.146645089069811	-0.120356828380402	0.17293334975922
h	0.129327955481348	0.126812907470235	2.51504801111244E-03	0.256140862951583
i	0.838517707124672	0.372308959888476	0.466208747236196	1.21082666701315
j	9.94636999781591E-02	0.101409923141898	-1.94622316373923E-03	0.200873623120057
k	0.132054041896099	0.152941802949502	-2.08877610534028E-02	0.2849958448456
l	1.11380918709058	0.197689668931051	0.916119518159526	1.31149885602163
m	1.0364489394206	0.215065258667576	0.821383680753026	1.25151419808818
n	0.994754498052574	0.218761464863047	0.775993033189526	1.21351596291562
o	1.1725755970704	0.239293466479739	0.933282130590664	1.41186906355014
p	1.87023630673677	0.32159887461149	1.54863743212528	2.19183518134826
q	1.31783396740116	0.114971401976762	1.2028625654244	1.43280536937792
r	1.30643510749473	0.24124315201056	1.06519195548417	1.54767825950529
s	1.89244011442982	0.381805004253894	1.51063511017593	2.27424511868371
t	0.909856903899469	0.433045332250903	0.476811571648567	1.34290223615037

Variance Analysis

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob(F)
Regression	19	100117.943854508	5269.36546602674	275.3500724	0
Error	1910	36551.6084770982	19.1369677890566		
Total	1929	136669.552331606			

APPENDIX I: CORRELATION MATRIX IN CASE 2

DataFit version 9.0.59
 11:01 AM Sunday, January 21, 2007
 Stepwise Selection Procedure

Correlation matrix

X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	Y
1	0.284673557	0.086009634	0.286132971	0.110011559	0.034674282	0.186258986	0.042435793	0.045939711	-0.065354196	-0.00218127	-0.007070607	-0.016874528	-0.037567923	-0.052230191	-0.022034985	-0.00392101	-0.035031049	-0.035915656	0.048390636	-0.082466163
X2	0.284673557	1	0.013012224	0.147946976	0.05517454	0.031071522	0.089633357	-0.101857194	0.095579134	0.02283004	0.072508938	-0.01728568	0.032192413	0.051481674	0.052706976	0.049938851	0.038862988	0.045645623	0.061346739	0.083213679
X3	0.086009634	0.013012224	1	0.358923594	-0.198435708	0.016718559	-0.281095328	-0.100202345	-0.060156806	0.174019903	-0.05824534	0.180047393	0.179379382	0.182047198	0.126227343	0.169932298	0.127659738	0.113762368	0.084129039	0.249383194
X4	0.286132971	0.147946976	0.358923594	1	-0.077868828	-0.077868828	0.1280623	-0.097453563	-0.069240339	0.060425474	-0.013798412	0.099771576	-0.07714856	0.077731373	0.048903084	0.068726122	0.083719519	0.039682215	0.007731211	0.081403723
X5	0.110011559	0.05517454	-0.198435708	-0.077868828	1	0.120139273	0.182721105	0.154932691	-0.06471693	-0.044056114	0.018232303	-0.046386741	0.000250342	-0.106306531	-0.080639072	-0.048727296	-0.077445638	-0.059474269	-0.053509241	-0.05243424
X6	0.024674282	0.031071522	0.016718559	0.01280623	0.120139273	1	-0.1807193	0.084117366	-0.025745935	-0.015901447	0.03944042	0.005664498	-0.002653192	-0.004406214	-0.013798252	0.012669031	-0.009878516	-0.051780725	-0.033523929	-0.015466382
X7	0.186258986	0.089633357	-0.281095328	-0.097453563	0.182721105	-0.1807193	1	0.500132316	-0.150701364	-0.162974395	-0.030839601	-0.098991709	0.031027833	-0.102126727	-0.127714761	-0.030418659	-0.105326498	-0.069578409	-0.045120193	-0.063225162
X8	0.042435793	-0.101857194	-0.100202345	-0.069240339	0.154932691	0.084117366	0.500132316	1	-0.48283236	-0.113237257	-0.06343962	-0.080737432	-0.034135316	-0.033540592	-0.030027737	-0.027940189	-0.034551332	-0.027940189	-0.124095197	-0.148959879
X9	0.045939711	0.065354196	-0.060156806	-0.031071522	-0.05517454	-0.031071522	-0.05517454	-0.150701364	-0.48283236	1	-0.126629602	0.078717158	0.015397169	0.072079143	0.037857804	0.035013786	-0.04040928	0.084032814	0.021702426	0.009911546
X10	-0.065354196	0.02283004	0.174019903	0.060425474	-0.044056114	-0.015901447	-0.113237257	-0.162974395	-0.126629602	1	0.019501259	0.080687416	0.010428454	0.014264544	0.012619358	0.014607726	0.059690956	0.080717593	0.075980209	0.074075189
X11	-0.00218127	0.040598823	-0.05824534	-0.013798412	0.018232303	0.03944042	-0.030839601	-0.060343662	0.078717158	0.019501259	1	0.020303192	0.049667913	-0.001614666	0.007099245	0.001668558	-0.010749981	0.01251433	0.037495327	0.048739815
X12	-0.007070607	0.072508938	0.180047393	0.099771576	-0.046386741	0.005664498	-0.089991709	-0.080737432	0.015397169	0.080687416	0.020303192	1	0.047977157	0.188349417	0.156242456	0.081338187	0.120598433	0.089641854	0.106403677	0.106037676
X13	-0.016874528	-0.01728568	-0.013798412	-0.077868828	0.000250342	-0.002653192	0.031027833	-0.034135316	0.072079143	0.010428454	0.049667913	0.047977157	1	0.432512617	0.39930728	0.39930728	0.047571624	0.087982963	0.138003976	0.393253987
X14	-0.037567923	0.032192413	0.179379382	0.077731373	-0.106306531	-0.044056114	-0.12726727	-0.12726727	0.037857904	0.121679358	-0.001614666	0.049667913	0.432512617	1	0.138355986	0.231095607	0.174560774	0.16393561	0.127487797	0.545308069
X15	-0.052230191	0.051481674	0.182047198	0.046903084	-0.080639072	-0.01378252	-0.127714761	-0.133540592	0.035013786	0.104607726	0.007099245	0.020303192	0.049667913	0.39930728	0.39930728	0.486271271	1	0.133457558	0.192199046	0.179314029
X16	-0.022034985	0.052706976	0.126227343	0.083719519	-0.048727296	-0.012669031	-0.030418659	-0.030027737	-0.00400928	0.059989956	0.001668558	0.01668558	0.081338187	0.138355986	0.133457558	0.133457558	0.133457558	0.077214304	0.100649563	0.084442757
X17	-0.0392101	0.04938851	0.169932298	0.083719519	-0.077445638	0.083719519	-0.077445638	-0.089878516	-0.105326498	-0.06074622	0.064032814	0.080717593	-0.010749981	0.120598433	0.103552329	0.231095607	0.215147335	0.254651016	0.235724481	0.107771697
X18	-0.035031049	0.038862988	0.127659738	0.039682215	-0.069474269	-0.051780725	-0.069578409	-0.034551332	0.021702426	0.075980209	0.01251433	0.089641854	0.047571624	0.174560774	0.192199046	0.077214304	0.254651016	1	0.292887988	0.120945454
X19	-0.035915656	0.045645623	0.051780725	0.007731211	-0.053509241	-0.033523929	-0.045120193	-0.027940189	0.001253374	0.070475189	0.037495327	0.106409877	0.087982963	0.16393561	0.179314029	0.100649563	0.235724481	0.292887988	1	0.11215045
X20	0.048390636	0.061346739	0.084129039	0.081403723	-0.05243424	-0.015466382	-0.063225162	-0.124095197	0.099911546	-0.017598397	0.048739815	0.109637676	0.138003976	0.127487797	0.089311124	0.084442757	0.107771697	0.120945454	0.11215045	1
Y	-0.082466163	0.083213679	0.249383194	0.064129039	-0.146977785	-0.017883253	-0.153686709	-0.148959879	0.086715418	0.141020216	0.038686899	0.349566304	0.383253987	0.545308069	0.516094011	0.288771084	0.58048233	0.436604089	0.420580106	0.243955757

Variance Inflation Factors

Variable	R ²	VIF
X1	0.204818082	1.257573968
X2	0.132407254	1.152614524
X3	0.28226565	1.39436785
X4	0.215704814	1.275030139
X5	0.096237022	1.106484802
X6	0.034794681	1.036048994
X7	0.364070469	1.572501279
X8	0.454196808	1.832162242
X9	0.289372338	1.407206689
X10	0.097493014	1.108024683
X11	0.02134461	1.021810139
X12	0.080342607	1.087361453
X13	0.246179655	1.326576029
X14	0.369260162	1.588439732
X15	0.29298261	1.412625433
X16	0.05122007	1.053985196
X17	0.146685371	1.171900888
X18	0.149919779	1.176356415
X19	0.138907331	1.161436596
X20	0.073114171	1.078881528

APPENDIX J: TABLE OF REGRESSION ANALYSIS IN CASE 3

DataFit version 9.0.59"

Equation ID: a*x1+b*x2+c*x3+d*x4+e*x5+f*x6+g*x7+h*x8+i*x9+j*x10+k*x11+l*x12+m*x13+n*x14+o*x15+p*x16+q*x17+r*x18+s*x19+t*x20

Model Definition:

Y = a*x1+b*x2+c*x3+d*x4+e*x5+f*x6+g*x7+h*x8+i*x9+j*x10+k*x11+l*x12+m*x13+n*x14+o*x15+p*x16+q*x17+r*x18+s*x19+t*x20

Number of observations = 1975

Number of missing observations = 444

Solver type: Nonlinear

Nonlinear iteration limit = 250

Diverging nonlinear iteration limit = 10

Number of nonlinear iterations performed = 7

Residual tolerance = 0.000000001

Sum of Residuals = 42.4220789475462

Average Residual = 2.14795336443272E-02

Residual Sum of Squares (Absolute) = 1974.72696432588

Residual Sum of Squares (Relative) = 1974.72696432588

Standard Error of the Estimate = 1.0050325959076

Coefficient of Multiple Determination (R²) = 0.9860025746

Proportion of Variance Explained = 98.60025746%

Adjusted coefficient of multiple determination (Ra²) = 0.9858665383

Durbin-Watson statistic = 1.92437183749362

Regression Variable Results

Variable	Value	Standard Error	t-ratio	Prob(t)
a	8.14710828957918E-02	5.08320529164078E-02	1.602750198	0.10915
b	0.050442821271364	3.08452681681315E-02	1.635350388	0.10214
c	0.118220551801054	2.29866073499379E-02	5.143018715	0.0
d	1.88571399167253E-02	1.83235873924379E-02	1.029118344	0.30355
e	0.146313476199833	3.89131568625686E-02	3.760000164	0.00017
f	-0.01351793620647	9.20488662414012E-03	-1.468560859	0.14211
g	1.03080055819782	3.99951288322019E-02	25.77315259	0.0
h	1.99487997043129E-02	9.54178468602089E-03	2.09067804	0.03669
i	0.164155524440147	0.032365442397976	5.071938224	0.0
j	1.07340747037487	2.58112338112029E-02	41.58683301	0.0
k	1.00264870792203	3.87765987825022E-02	25.85705656	0.0
l	1.01981690274159	1.73972740754199E-02	58.61935027	0.0
m	0.960772559022428	1.88346782633677E-02	51.01082936	0.0
n	0.992002508703029	1.92052321975254E-02	51.65272143	0.0
o	1.04581491584247	2.09343094395551E-02	49.95698181	0.0
p	1.12518002475054	2.85608948756146E-02	39.39582529	0.0
q	1.06799803871413	1.02190475658908E-02	104.5105262	0.0
r	1.05655092086893	2.12547292042626E-02	49.70898056	0.0
s	1.07156531534435	3.37628852147629E-02	31.73796637	0.0
T	1.01244784057942	5.63742857623857E-03	179.59391	0.0

68% Confidence Intervals

Variable	Value	68% (+/-)	Lower Limit	Upper Limit
a	8.14710828957918E-02	5.05626430359508E-02	0.030908439859841	0.132033725931743
b	0.050442821271364	3.06817882468404E-02	1.97610330245236E-02	8.11246095182044E-02
c	0.118220551801054	2.28647783309833E-02	9.53557734700708E-02	0.141085330132037

d	1.88571399167253E-02	1.82264723792579E-02	6.30667537467339E-04	3.70836122959832E-02
e	0.146313476199833	0.038706917131197	0.107606559068636	0.18502039333103
f	-0.01351793620647	9.15610072503218E-03	-2.26740369315022E-02	-4.3618354814378E-03
g	1.03080055819782	3.97831546493912E-02	0.991017403548426	1.07058371284721
h	1.99487997043129E-02	9.49121322718497E-03	1.04575864771279E-02	2.94400129314979E-02
i	0.164155524440147	3.21939055532667E-02	0.13196161888688	0.196349429993414
j	1.07340747037487	2.56744342720035E-02	1.04773303610287	1.09908190464687
k	1.00264870792203	0.038571082808955	0.964077625113077	1.04121979073099
l	1.01981690274159	1.73050685228201E-02	1.00251183421877	1.03712197126441
m	0.960772559022428	1.87348544685718E-02	0.942037704553856	0.979507413491
n	0.992002508703029	1.91034444668785E-02	0.97289906423615	1.01110595316991
o	1.04581491584247	2.08233575995255E-02	1.02499155824294	1.06663827344199
p	1.12518002475054	2.84095221327738E-02	1.09677050261777	1.15358954688331
q	1.06799803871413	1.01648866137915E-02	1.05783315210034	1.07816292532793
r	1.05655092086893	0.02114207913948	1.03540884172945	1.07769300000841
s	1.07156531534435	3.35839419231247E-02	1.03798137342123	1.10514925726748
t	1.01244784057942	5.60755020478451E-03	1.00684029037463	1.0180553907842

90% Confidence Intervals

Variable	Value	90% (+/-)	Lower Limit	Upper Limit
a	8.14710828957918E-02	8.36492262792406E-02	-2.17814338344882E-03	0.165120309175032
b	0.050442821271364	5.07589732974771E-02	-3.1615202611314E-04	0.101201794568841
c	0.118220551801054	3.78267610550579E-02	8.03937907459962E-02	0.156047312856112
d	1.88571399167253E-02	3.01532954129957E-02	-1.12961554962705E-02	0.049010435329721
e	0.146313476199833	6.40354909330429E-02	8.22779852667904E-02	0.210348967132876
f	-0.01351793620647	0.015147561428685	-0.028665497635155	0.001629625222215
g	1.03080055819782	6.58159840062715E-02	0.964984574191545	1.09661654220409
h	1.99487997043129E-02	0.015701960879316	4.24683882499692E-03	3.56507605836289E-02
i	0.164155524440147	5.32605720101093E-02	0.110894952430038	0.217416096450256
j	1.07340747037487	4.24749663597155E-02	1.03093250401516	1.11588243673459
k	1.00264870792203	6.38107709564857E-02	0.938837936965547	1.06645947887852
l	1.01981690274159	2.86289542185109E-02	0.991187948523079	1.0484458569601
m	0.960772559022428	3.09943465501979E-02	0.92977821247223	0.991766905572626
n	0.992002508703029	3.16041301042477E-02	0.960398378598781	1.02360663880728
o	1.04581491584247	3.44494996137319E-02	1.01136541622874	1.0802644154562
p	1.12518002475054	4.69998086073113E-02	1.07818021614323	1.17217983335785
q	1.06799803871413	1.68164646744298E-02	1.0511815740397	1.08481450338856
r	1.05655092086893	3.49767823785345E-02	1.0215741384904	1.09152770324747
s	1.07156531534435	5.55602039094138E-02	1.01600511143494	1.12712551925377
t	1.01244784057942	9.27695246505819E-03	1.00317088811436	1.02172479304448

95% Confidence Intervals

Variable	Value	95% (+/-)	Lower Limit	Upper Limit
a	8.14710828957918E-02	9.96918221796589E-02	-1.82207392838671E-02	0.181162905075451
b	0.050442821271364	6.04937399313394E-02	-1.00509186599754E-02	0.110936561202703
c	0.118220551801054	4.50813343346983E-02	7.31392174663558E-02	0.163301866135752
d	1.88571399167253E-02	3.59362195940491E-02	-1.70790796773238E-02	5.47933595107744E-02
e	0.146313476199833	7.63164832388695E-02	6.99969929609637E-02	0.222629959438703
f	-0.01351793620647	1.80526236472636E-02	-3.15705598537336E-02	4.53468744079362E-03
g	1.03080055819782	7.84384466657144E-02	0.952362111532102	1.10923900486353

h	1.99487997043129E-02	1.87133481262242E-02	1.23545157808872E-03	3.86621478305371E-02
i	0.164155524440147	6.34751056309105E-02	0.100680418809237	0.227630630071058
j	1.07340747037487	5.06209917505311E-02	1.02278647862434	1.1240284621254
k	1.00264870792203	7.60486655322434E-02	0.926600042389789	1.07869737345428
l	1.01981690274159	3.41195339167134E-02	0.985697368824877	1.0539364366583
m	0.960772559022428	3.69385710101167E-02	0.923833988012312	0.997711130032545
n	0.992002508703029	3.76653013857867E-02	0.954337207317242	1.02966781008882
o	1.04581491584247	4.10563676728555E-02	1.00475854816961	1.08687128351532
p	1.12518002475054	5.601362703000553E-02	1.06916639772048	1.1811936517806
q	1.06799803871413	0.020041596086225	1.04795644262791	1.08803963480036
r	1.05655092086893	4.16847749153997E-02	1.01486614595353	1.09823569578433
s	1.07156531534435	0.066215770483193	1.00534954486116	1.13778108582755
t	1.01244784057942	1.10561249237191E-02	1.0013917156557	1.02350396550314

99% Confidence Intervals

Variable	Value	99% (+/-)	Lower Limit	Upper Limit
a	8.14710828957918E-02	0.131060282034374	-4.95891991385824E-02	0.212531364930166
b	0.050442821271364	7.95283549178934E-02	-2.90855336465294E-02	0.129971176189257
c	0.118220551801054	0.059266369730345	5.89541820707091E-02	0.177486921531399
d	1.88571399167253E-02	4.72437053739225E-02	-2.83865654571972E-02	6.61008452906478E-02
e	0.146313476199833	0.100329792338761	4.59836838610727E-02	0.246643268538594
f	-0.01351793620647	2.37329591830205E-02	-3.72508953894904E-02	1.02150229765505E-02
g	1.03080055819782	0.103119440668066	0.927681117529751	1.13391999886588
h	1.99487997043129E-02	2.46015834559676E-02	-4.65278375165476E-03	4.45503831602805E-02
i	0.164155524440147	8.34478201347015E-02	8.07077043054456E-02	0.247603344574849
j	1.07340747037487	6.65491041354244E-02	1.00685836623945	1.1399565745103
k	1.00264870792203	9.99777046409255E-02	0.902671003281107	1.10262641256296
l	1.01981690274159	0.044855391748655	0.974961510992935	1.06467229449024
m	0.960772559022428	4.85614509664409E-02	0.912211108055987	1.00933400998887
n	0.992002508703029	4.95168501748796E-02	0.942485658528149	1.04151935887791
o	1.04581491584247	5.39749300280049E-02	0.991839985814464	1.09978984587047
p	1.12518002475054	0.073638555257797	1.05154146949274	1.19881858000834
q	1.06799803871413	2.63477703391361E-02	1.041650268375	1.09434580905327
r	1.05655092086893	5.48010683073501E-02	1.00174985256158	1.11135198917628
s	1.07156531534435	8.70508469492232E-02	0.984514468395132	1.15861616229358
t	1.01244784057942	1.45349820981159E-02	0.997912858481301	1.02698282267753

Variance Analysis

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob(F)
Regression	19	139103.143415421	7321.21807449586	7248,081175	0
Error	1955	1974.72696432588	1.01009051883677		
Total	1974	141077.870379747			

APPENDIX K: CORRELATION MATRIX IN CASE 3

DataFit version 9.0.59
11:18 AM Sunday, January 21, 2007
Stepwise Selection Procedure

Correlation matrix

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	Y
X1	1	0.287827629	0.07075511	0.290315384	0.114590948	0.031148278	-0.068269598	0.049884902	0.047888841	0.051528535	0.044965308	-0.000272537	-0.011984239	-0.035902455	-0.049472501	X16	X17	X18	X19	X20	Y
X2	0.287827629	1	0.009843727	0.151438413	0.052782334	0.034456496	0.002328265	-0.098106004	0.098041905	0.037492759	0.061136796	0.069593884	-0.013592936	0.029736893	0.04909366	0.046772272	0.043997435	-0.03703879	-0.033014053	-0.045984403	0.077992752
X3	0.07975511	0.009843727	1	0.349235968	-0.197394821	0.014104858	0.01980236	-0.104628119	-0.061562047	0.045566164	0.082798786	0.176219322	-0.043796457	0.180844641	0.181274866	0.123468416	0.174001361	0.129172744	0.110753296	0.108893748	0.248995258
X4	0.290315384	0.151438413	0.349235968	1	-0.072569239	0.019331795	0.01624477	-0.062389594	-0.08992733	0.039614036	0.081903443	0.094170207	-0.070301124	0.074674789	0.046351586	0.069939091	0.084620243	0.035897722	0.006477452	0.035206405	0.057761715
X5	0.114590948	0.052782334	-0.197394821	-0.072569239	1	0.120593358	-0.056046281	0.155500753	-0.068032776	-0.030906451	0.155500753	-0.068032776	-0.030906451	0.155500753	-0.068032776	-0.030906451	0.155500753	-0.068032776	-0.030906451	0.155500753	-0.068032776
X6	0.031148278	0.034456496	0.014104858	0.019331795	0.120593358	1	-0.013485239	0.08659646	-0.024798539	-0.01120898	-0.015359086	0.009130934	0.003509158	0.000289447	0.0013471488	0.000289447	0.0013471488	-0.006105513	-0.046203374	-0.027778565	0.009666179
X7	-0.068269598	0.002328265	0.01624477	-0.056046281	-0.013485239	-0.013485239	1	-0.014907975	0.942379531	0.0344325	0.20160964	0.051948245	-0.009623782	0.001864219	0.023456097	0.044062964	0.054327579	0.028140644	0.02664607	0.136794241	
X8	0.049884902	-0.098106004	-0.104628119	-0.062389594	0.155500753	0.08659646	-0.014907975	1	-0.475714827	-0.067231044	-0.11634242	-0.074702556	-0.02842258	-0.02998112	-0.132173342	-0.025959498	-0.093123329	-0.031754295	-0.021008051	-0.054397019	-0.142059713
X9	0.047888841	0.098041905	-0.061562047	-0.08992733	-0.068032776	-0.030906451	-0.024798539	0.042379531	1	0.063152094	0.09913703	0.10121781	0.07330655	0.029645824	0.030631791	-0.009104459	0.056826385	0.023140422	0.001705117	0.02365417	0.0744429
X10	0.051528535	0.037492759	0.045566164	0.039614036	-0.030906451	-0.01120898	0.00344325	-0.067231044	0.063152094	1	0.031310033	0.050838475	-0.029887313	0.026653692	0.019820295	0.008406163	0.00462107	0.03217196	0.087056533	0.056615848	0.196402128
X11	0.044965308	0.061136796	0.082798786	0.081903443	-0.050322823	-0.015359086	0.20160964	-0.118343242	0.09913703	0.031310033	1	0.102122716	0.135804139	0.124709137	0.080525888	0.084366487	0.102108652	0.122706324	0.110416085	0.02078499	0.240463985
X12	-0.000272537	0.029736893	0.176219322	0.094170207	-0.04373118	0.009130934	0.051948245	-0.074702556	0.10121781	0.050838475	0.102122716	1	0.054315083	0.190834576	0.160429859	0.082513981	0.127612931	0.089306678	0.116984592	0.077649736	0.35296476
X13	-0.011984239	-0.013592936	-0.043796457	-0.070301124	0.14127E-05	0.003509158	0.043175003	-0.02842258	0.07330655	-0.029887313	0.135804139	0.054315083	1	0.431889208	0.296932128	0.104721084	0.100726414	0.047404672	0.088059711	0.058744304	0.378206496
X14	-0.035902455	0.029736893	0.180844641	0.074874789	-0.098713931	0.000289447	-0.00292382	-0.092998112	0.029644924	0.026653692	0.124709137	0.190634578	0.431889208	1	0.483244087	0.138648873	0.234480196	0.175813994	0.166890984	0.118437484	0.544023768
X15	-0.049472501	0.04909366	0.181274866	0.046351586	-0.077003126	-0.012063966	0.001864219	-0.132173342	0.030631791	0.019820295	0.080525888	0.160429859	0.296932128	0.483244087	1	0.131862787	0.215928454	0.18566124	0.181296473	0.134171769	0.510243277
X16	-0.02032104	0.04772272	0.123468416	0.089939091	-0.042373501	0.013471488	0.023456097	-0.025959498	-0.009104459	0.009461653	0.084366487	0.082513981	0.104721084	0.138648873	0.131862787	1	0.072622155	0.076260073	0.103379012	0.143515115	0.293274742
X17	0.000716017	0.043997435	0.174001361	0.084620243	-0.068374344	-0.006105513	0.04402984	-0.093123329	0.056826385	0.094062107	0.102108652	0.127612931	0.100726414	0.234480196	0.215928454	0.072622155	1	0.257029179	0.238468614	0.18238204	0.587351472
X18	-0.037303879	0.038965333	0.129172744	0.035897722	-0.064600029	-0.046203374	0.054327579	-0.031754295	0.023140422	0.03217196	0.122706324	0.089306678	0.047404672	0.175813994	0.18566124	0.076260073	0.257029179	1	0.230375547	0.157988859	0.433636036
X19	-0.033014053	0.046067037	0.110753296	0.006477452	-0.054665347	-0.027778565	0.028140644	-0.021008051	0.001705117	0.007649736	0.080525888	0.10416085	0.118437484	0.166890984	0.181296473	0.106379012	0.238468614	0.230375547	1	0.196552425	0.423373428
X20	-0.114623953	0.045984403	0.057761715	0.035206405	-0.092794095	0.009666179	0.02664607	-0.054397019	0.02395417	0.056216848	0.02078499	0.077649736	0.088744304	0.118437484	0.134171769	0.143515115	0.18238204	0.157988859	0.196552425	1	0.681758878
Y	-0.077644828	0.077992752	0.248995258	0.095776175	-0.138894764	-0.013758965	0.136794241	-0.142059713	0.07644429	0.240463985	0.355296476	0.378206496	0.544023768	0.510243277	0.293274742	0.587351472	0.433636036	0.423373428	0.681758878	1	

Variance Inflation Factors

Variable	R2	VIF
X1	0.200682112	1.251066709
X2	0.121381309	1.138150156
X3	0.234764669	1.368787545
X4	0.211069126	1.267538175
X5	0.095324134	1.105368274
X6	0.02685002	1.027416614
X7	0.055221353	1.058448985
X8	0.285097716	1.398792566
X9	0.257177654	1.346216906
X10	0.02601497	1.026709626
X11	0.101921863	1.113488859
X12	0.080221503	1.087218285
X13	0.241073012	1.317649808
X14	0.369067344	1.584952211
X15	0.286213217	1.400978589
X16	0.058853641	1.062533994
X17	0.160275745	1.190867114
X18	0.152104375	1.179300446
X19	0.153565446	1.181426249
X20	0.103147866	1.115011005