A NEW METHODOLOGY PROPOSAL for URBAN REGENERATION of BROWNFIELD AREAS; CASE STUDY of ZONGULDAK CITY, TURKEY

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DECLARATION

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

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ABBREVIATION LIST

CABERNET- Concerted Action on Brownfields and Economic Regeneration Network

ECI - European Common Indicators

EPA - U.S. Environmental Protection Agency

ESDP - European Spatial Development Perspective

GNP - Gross National Product

IBA - International Building Exhibition

SWOT - Strength-Weakness-Opportunity-Threat

TTK - Turkish Hard Coal Enterprises (Türkiye Taşkömürü Kurumu)

UK - United Kingdom

USA - United States of America

ZBKP - Zonguldak-Karabük-Bartın Regional Development Project

ZMA - Zonguldak Metropolitan Area (Zonguldak Metropolitan Alanı)

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ABSTRACT

The study focuses on environmental impacts of abandoned urban areas and provides a solution to this problem through scientific methods. Many cities often suffer from lack of sustainable regulations and a successful approach to the urban development. In order to have a successful approach, urban regeneration might prove to be a valid solution for abandoned areas. However, cities still do not have a definite or proper solution for abandoned areas. Therefore, this study conducts a quantitative (Grid Based Model-Hierarchical Cluster Analysis) and qualitative (Strength-Weakness-Opportunity-Threat [SWOT]) analysis with a specific focus on potential solutions for Brownfield areas.

The detailed study has placed emphasis on appropriate development for the cities. This practice of urban development has defined healthy and sustainable approaches to the cities. Various analysis techniques included within the newly developed model for abandoned urban areas should provide a more clear-cut sustainable development through new mechanisms. The method employed in the study could bring a new approach to the urban design application.

This study includes comprehensive ecological, economic and social analyses through the method proposed as a solution for abandoned industrial areas. This approach extends as far as urban regeneration projects through spatial analyses. The purpose of this study is to explore and provide an approach to solutions for Brownfield areas. The embracing quantitative and qualitative methods contribute to a growing knowledge on the approaches to solutions for Brownfield areas. This scientific approach can lead to a detailed analysis of the issue.

This study makes an attempt to incorporate appropriate and sustainable urbanization into urban regeneration experiences in cities. The methods employed in the study could emphasize the right kind of approach to and right implication for regaining urban derelict areas in a theoretical background.

Consequently, the study could emphasize an economic, social and ecological approach to abandoned areas in city development. Especially, urban abandoned areas need a new urban development approach, which, in turn, could yield a possible solution in urban regeneration project. In this study, quantitative and qualitative data analyses tailor on urban structure through scientific methods. And finally, to help establish a design decision model on Brownfield areas, this study puts emphasis on the approaches to solutions based on green areas standards in Turkey.

Key Words: Urban Abandoned Areas, Quantitative Analysis, Grid Based Model, Hierarchical Cluster Analysis, Qualitative Analysis, SWOT Analysis, Urban Regeneration

1-INTRODUCTION

The process of urbanization is undergoing a fast change. These changes have an influence on economy, ecology and social movement in cities. Currently, shrinking problem presents itself as a major problem in developed countries. In their history of urbanization, cities have achieved the greatest development during the industrial revolution. Industrial areas and its surrounding have served as settlement areas for employees as well as economic development of cities. The industrial revolution had a profound influence on the urban development until the post-industrial era started in developed countries. The economic impact on cities serves as a key point of the globalization and industrialization. Global industry must compete with their firms all over the world in order to survive in the market [1][1]. This principle is the reason for abolishing boundaries on the basis of a new industrialization approach. Industry is now located where there are chances to find the cheapest raw materials and cheapest workers in the current economic development. Because of this development, industrial areas have been decaying and cities in developed countries have started to suffer from industrial decline over the last two decades. Shrinking cities and Brownfield sites have gradually become a significant problem for the developed countries during this process of development. This change in land use has resulted in significantly vacant areas and derelict lands in urban areas. Vacant areas and derelict lands are among the negative results due to the breakdown of the core industries in cities. These areas should be regained through efficient uses in order to ensure appropriate and efficient environmental development.

The demand for urbanization increased dramatically during the industrial revolution in the 19th and 20th centuries. Land use and urban sprawl were two major concerns during this period. These two factors led to common problems in urban areas. Among such problems were inefficient land uses, imbalanced development and lack of basic infrastructures. Natural areas and those areas surrounding urban areas were damaged by these problems during the industrial development.

Following the industrial revolution, the post-industrialized urbanization stage began

[1] These numbers (in the paragraphs and under the tables and figures) are related to the list of internet sources at the end of the dissertation.

which was characterized by new economic, ecological and social advances. The post-industrialized urbanization is called the era of informational industry (NI and NI, 2003). Because of this transition from heavy industry to informational industry, there is a rapid movement towards the deindustrialization process. It should be noted that the deindustrialization process has a number of negative impacts on the urban environment. It threatens to replace the abandoned areas, derelict houses and contamination lands. In the broad process of deindustrialization, the urbanization also goes in the direction of shrinking problems.

Currently, Brownfield sites present particular challenges to national and regional policymakers in terms of bringing the land back into beneficial use and in terms of creating healthy development in the cities (FERBER and GRIMSKI, 2002). In this context, the solution to the Brownfield process makes an attempt to manage environmental restoration and to create sustainable land planning and economic policy. The particular point is that a successful Brownfield redevelopment provides a combination of economic, ecological and social approaches that can be integrated into solutions.

The process of urbanization leads to many problems in demographic, social and economic development. The approaches to solutions for the problems offer a guide or attempt to appropriate solutions step by step for further development. The diagnosis of shrinking cities is depicted to explain regeneration projects or approaches. At this point, regeneration projects or approaches are gradually proving to be the only solution in terms of using a combination of economic, ecological and social components. According to Roberts (2000), development of urban regeneration process can be summarized as follows (Table 1-1);

Table-1.1: Progress of the Regeneration Process from 1950 to 1990

YEAR	PROCESS
1950 RECONSTRUCTION	Reconstruction of outmoded areas and emerging of suburbs; Participation of private entrepreneurs in addition to central and local governments; targets to improve residential and living standards of public sector investments; inner urban

	areas and close neighborhood importance.
1960 REVITALISATION	Growth of suburbs; Balance of public and private sector; Regional level in actions, increasing importance of private sector; improvement of social conditions and welfare; improvement of existing areas.
1970 RENEWAL	Intensity on renewal and district projects; close proximity developments, increasing importance of private sector; localization becoming visible increases in imperative resources of the public and in private investments; social-based actions, renewal of outmoded urban infrastructure, environmental improvements with new inventions.
1980 REDEVELOPMENT	Redevelopment projects, off-city projects, giving importance to the private sector and to expertise units, increasing partnerships; intensity in local scale in early 1980s, selective government incentive, replacement and redevelopment projects, broad environmental approaches.
1990 RECREATION	Inclination towards detailed approaches in policies and applications, integrated education, dominance of partnerships, representation of strategic perspectives, development of regional actions, balances between public and private sector funds, role of society gaining importance, more modest conservation, presentation of idea of broad-scope, sustainable environment.

Source: ROBERTS, 2000; ÖZDEN, 2002

The process of urban regeneration shows that urban regeneration approaches must ensure coordination between sustainable development and healthy environment in Brownfield areas. These efforts could play a key role in supporting the guide to the same problem in cities. European cities are also focused on solutions to the process of deindustrialization as the other developed countries are. Sustainability profile of European cities is committed to using a common approach to the abandoned areas

within European Common Indicators (ECI) and European Spatial Development (ESDP). The approaches and standards of regeneration implementation are set by these guidelines and regulations in European cities. ECI regulation would ensure a more efficient sustainable land use approach to the cities in indicator 9 [2];

"*a) Urbanized or artificially modeled land: the size of artificially modeled area as a percentage of the total municipality area;*
b) Derelict or contaminated land: the size of derelict or contaminated area (m²);
c) Intensity of use: number of inhabitants per km² of the area classified as "urbanized land;
d) New development: new building on virgin area (Greenfield sites) and new building on contaminated or derelict area (Brownfield sites) compared to the total area (%);
e) Restoration of the areas;

- *Renovation and conservation of derelict buildings (total number);*
- *Renovation and conservation of derelict buildings (total of m² of each floor);*
- *Redevelopment of derelict areas for new uses, including public open spaces (area in m²);*
- *Cleansing of contaminated land (area in m²);*

f) Protected areas: size of the protected area as a percentage of the municipal area."

These strategies share particular emphasis on sustainable development for cities. It is important to continually build new strategies for sustainability depending on new problems in cities**.** In order to encourage sustainable development, Brownfield sites have many opportunities for these improvements and developments. Thus, such developments can lead to positive impacts on the environment and eliminate these unfavorable conditions.

Urban regeneration approaches must be adopted for sustainable development in order to recycle derelict land and buildings, which can contribute to increases in sustainable urban development and reducing unhealthy condition (COUCH and DENEMANN, 2000).

A major approach of regeneration implementation serves to emphasize the possibility of place advantage. Urban regeneration plays a pivotal role in healthy urban

development in a long process of regaining underused areas. Regeneration projects that provide strong evidence for effectiveness of sustainability are characterized by economic, ecological and social components.

The requirement of urban regeneration is based on a three dimensional process, namely economic, social and ecological development in abandoned areas. This is the most effective improvement on the built healthy environment identified in old industrial areas. However, the main emphasis of the argument does not have a more comprehensive approach to abandoned areas and thus there is a notable lack of evaluation of the characteristics of abandoned areas.

From this perspective, this study investigates the potential solutions for Brownfield areas in the urban development and attempts to address a new fundamental theoretical approach. The methodology offers great flexibility to integrate quantitative (Grid Based Model-Hierarchical Cluster Analysis) and qualitative (SWOT) analyses with each other. The quantitative analysis aims to adapt a new approach with qualitative analysis to the problem and draw up guidelines for Turkish cities. A new model is proposed for abandoned problem. This model is, first of all, based on land use standards and creating a design decision in the abandoned areas. The characteristics of Brownfield areas ought to be attached great importance for the sustainable development. An evaluation of urban regeneration sites is included in order to facilitate understanding the key issues within the model implementation.

A brief review of Brownfield problem is presented in the case study of Zonguldak in order to provide an understanding of the problem and to propose a solution through within scientific methods. In particular, this study seeks an answer to the following scientific questions;

1- Which planning instrument and process can be used for the solution development for Turkish cities?
2- How can Brownfield areas be integrated to the city development?

In the methodology, exploring the abandoned areas in Zonguldak is recognized as necessary for the urban regeneration argument and sustainable growth in our

methodology. The methodology can be identified as discovering the possibilities and opportunities in the Brownfield problem. Intended to serve as an agent for the methodology of abandoned areas, Zonguldak plays a key role in identifying solution options and evaluating the effects of urban development.

1.1. The Purpose of Investigation

The decreasing importance of the traditional industries can be called the process of deindustrialization [3]. The process of deindustrialization is a new experience in the urban areas of Turkey. This development has left behind a legacy abandoned or underutilized industrial, commercial properties and derelict houses in cities [4]. The regeneration studies usually tend to focus on economic and environmental development in the abandoned areas.

The sharpest decline of industrial development has been observed in developed countries through the deindustrialization process. For example, the city of Halle/Leipzig is one of the areas that suffer from deindustrialization and suburbanization problem (COLLINS, 2003). Halle/Leipzig has got an unemployment level of 20 percent after reunification (COLLINS, 2003). Manchester/Liverpool is suffering demographically and economically from the consequences of deindustrialization, sub-urbanization like Halle/Leipzig [5]. It is obvious that developed countries consider regeneration approaches as a solution in shrinking cities. The solution emphasizes the importance of economic, ecological and social components.

"There are three bodies of literature that are quickly growing in regeneration scope and content- sustainability, sustainable development and Brownfield redevelopment" [4]. Each sustainable urban development project lacks a unique solution set of the characteristics of Brownfield or deindustrialization areas within regeneration approaches. The regeneration approach is still an important technique for providing sustainability control for Brownfield areas. Nevertheless, a detailed analysis of Brownfield areas is required for regeneration projects and so is analyzing the characteristics of Brownfield areas.

Redevelopment of Brownfield land is regarded as an essential component of the achievement of sustainable urban regeneration in the city development (DETR 2000;

ODPM 2004; PEDIADITI et al., 2005). The sustainability and sustainable approaches can be a significant objective of Brownfield redevelopment. However, the main problem of the Brownfield solution is that it cannot set an appropriate and detailed analysis for the abandoned areas. Sustainable Brownfield implementations refer to redevelopment and growth in the abandoned areas that are maintained over long-term and protect the natural environment [4].

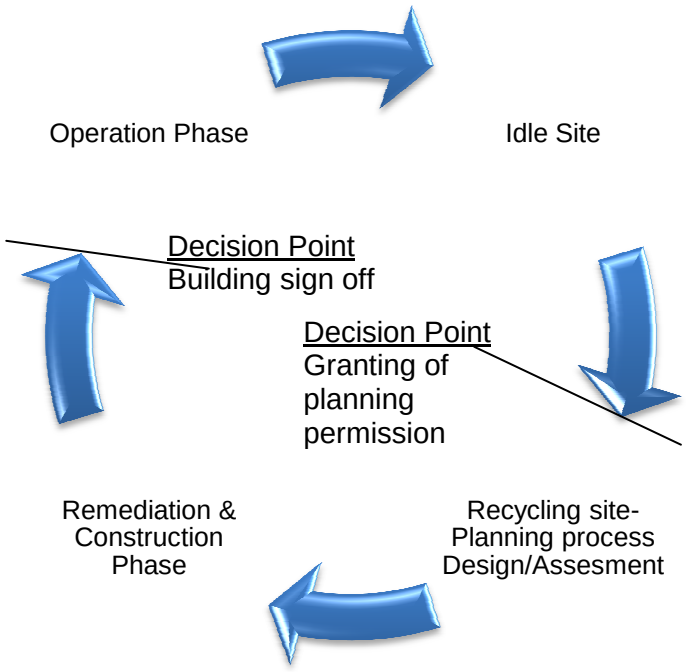
The idea of sustainable development grows considerably in regeneration implementations for the abandoned areas. Despite the emergency of urban regeneration and sustainable development as parallel strands of land use development, there has been little co-ordination between them and an imbalance in action with greater emphasis given to achieving urban regeneration (COUCH and DENEMANN, 2000). The process of urban change necessarily incorporates cycles of growth, decline and regeneration (BERRY et al., 1993). The urban regeneration implementation is based on physical, economic and social renewal in abandoned areas (MCCARTHY and POLLOCK, 1997). Brownfield areas require a detailed analysis into the characteristics of the areas in the regeneration process. From this perspective, the current trend in the sustainable approach to abandoned areas need a revision within regeneration implementations for a detailed analysis.

The approach to Brownfield redevelopment should include a remarkably detailed analysis for achieving sustainable development. The tools used for the Brownfield areas in this study promote sustainable development that enhances the natural and built environment in ways that are compatible with each other (GREED, 1999);

- "*The requirement to conserve the stock of natural assets, wherever possible offsetting any unavoidable reduction by a compensating increase so that the total is left undiminished*
- *The need to avoid damaging the regenerative capacity of the world's natural ecosystem*
- *The need to achieve greater social equity*
- *The avoidance of the imposition of added costs or risks on succeeding generations."*

According to Pediaditi et al. (2005), the life cycle of a Brownfield redevelopment can be broadly divided into three separate phases, namely: planning and design, construction and remediation and operation (Figure–1.1). The land use planning and design phase are crucial in the life cycle of Brownfield redevelopment (PEDIADITI et al., 2005), but there is no strong technique for analyzing the data on the land use planning and design phase. The land use planning and design phase still need to be developed on the basis of a new methodological approach. Therefore, the approach that is recommended must support the extensive analysis of these phases for the sustainability.

Figure -1.1: The Brownfield Redevelopment Project Life Cycle



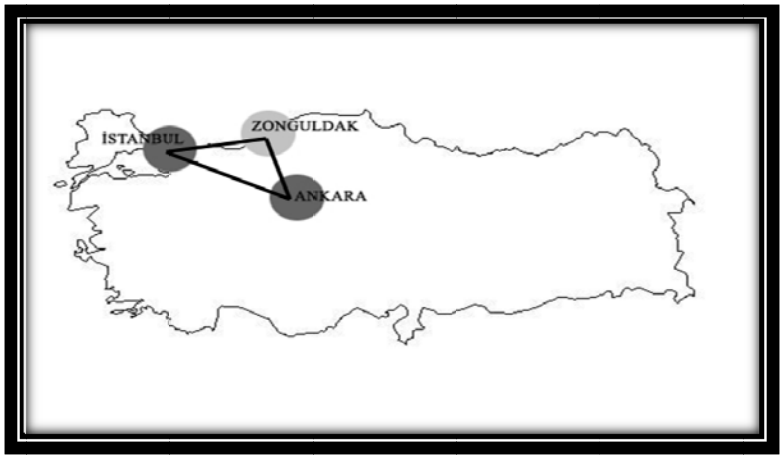
Source: PEDIADITI et al., 2005

A top-down[(2)] (the method of this study is a complete analysis from macro level to micro level for abandoned areas) analysis approach is a necessary methodological system in terms of sustainable city development in Brownfield areas. This new methodological approach can help avoid the repetition of classical methods in Brownfield areas. It offers a healthy environment and is perfectly suited for a detailed evaluation of the problem.

[2] To see for more information: http://en.wikipedia.org/wiki/Top-down_and_bottom-up_design.

As mentioned above, Turkish cities have recently started to experience the process of deindustrialization development. Zonguldak is the city that is currently suffering from and declining with economic development and unemployment in Turkey. The economic analysis has suggested that coal production is one of the major economic development drivers in the city. About 80% of Zonguldak's labor force is engaged in coal and coal production [6]. Zonguldak is connected by road and rail to Ankara and by sea and road to Istanbul [7] (Figure-1.2). Although Zonguldak is a charming city thanks to the connection to the metropolitan cities in Turkey, it suffers from a number of problems like land use, shrinking problem and transportation. Shrinking coal mining industry is one of the main problems in the city development. In regard to the economic and social decline in the city, the problem has caused a rise in the number of abandoned areas and vicinity of abandoned areas.

Figure -1.2: Distance of Zonguldak City from Ankara and Istanbul



Source: [8], (The Figure is prepared by Mustafa ERGEN, 2009)

The closure of coal mining areas has led to an increased unemployment problem in city development. It is characterized by economic decline and lack of job opportunities. Shrinking, in this sense, is a major problem in Zonguldak's coal mining areas. The regeneration structures are the key sustainability phenomena for an integrated study of urban abandoned areas.

Zonguldak is a city requiring recommendations within a framework to support sustainability for former coal mining areas. This state of Brownfield provides opportunities to analyze the problem through a new scientific approach to the city.

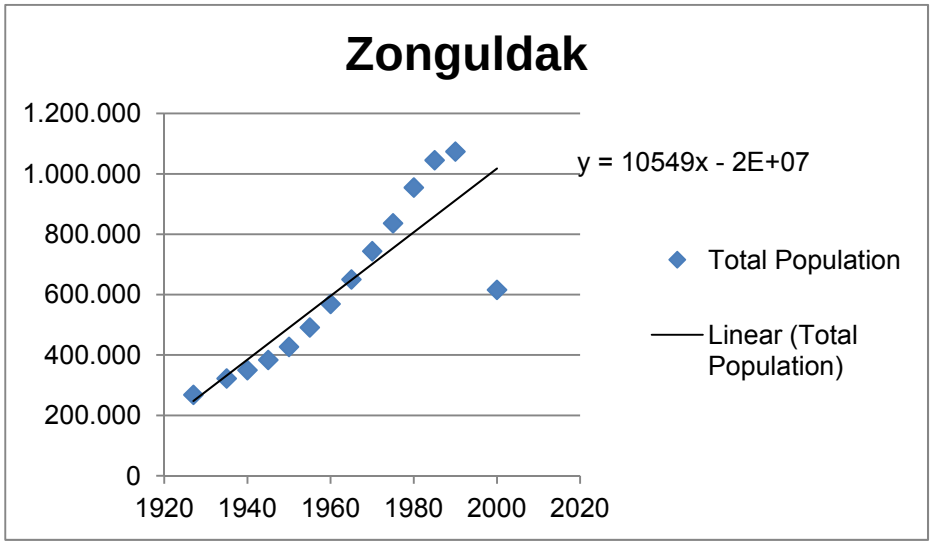
The vigorous growth of deindustrialization in coal mining areas enables one to understand the problem in Turkish cities. Implementing current regeneration approaches may not be a solution on its own for an extensive analysis in Brownfield areas.

Although Zonguldak has the highest population of employees in the region, the problems are currently based on economic and population decline. The conditions in Zonguldak show that shrinking problem results in a substantial increase in recession and unemployment. The characteristics of the problem in Zonguldak are significant indicators of the former coal mining areas. In general, this inner city problem in Zonguldak emphasizes conditions related to either economic decline or unplanned development.

Zonguldak suffers from shrinking problem like other coal mining areas, many of which are depressed with high unemployment rates, vacant homes, and abandoned coal mining areas (LEWIS, 2008). The population has started to decrease in the last few years due to the migration from Zonguldak to other cities. Economic conditions and limitations of development options have a direct effect on the increase in population decline. Recently, these adverse conditions have made it necessary to make recommendations to implement a regeneration solution for Zonguldak city development.

The decline in the coal mining areas, population loss and disappearance of social livability are some of the shrinkage consequences of the closure of coal mining areas. Areas underused for coal mining structures need a solution integrated into the city planning for sustainable and healthy development. An important approach to this development provides the basic Brownfield redevelopment strategies in the city development.

Figure -1.3: Between 1927 and 2000 Zonguldak Population Situation[3]



Source: ANONYMUS, 2002

During the last 80 years, Zonguldak's population has increased depending on economic conditions (Figure-1.3). Nevertheless, in early 2000s, the population started to decline because of the closure of coal mining areas. Currently, the largest economic development of shrinkage and population decline can be observed in Zonguldak.

The solution of Brownfield redevelopment is focused on economic, ecological and social demands in the abandoned areas. Additionally, Brownfield redevelopment requires an evaluation of spatial information for an appropriate solution. In this study, exploring the spatial impacts of abandoned areas is emphasized for a new methodological approach integrated into the regeneration solution. The case of Zonguldak requires a particular methodology for an analysis of proper solutions for abandoned areas. The method used in this study analyzes quantitative and qualitative method for proper solutions for the derelict areas. A priority of this methodology is to ensure a sustainable cooperation between abandoned areas and the shrinking problem. The design decision model on abandoned areas will enable the methodology to be completed. The research concludes with a conceptual

[3] Bartın and Karabük provinces were separated from the Zonguldak province. The population of Zonguldak province in 1990 is 653.739 [In the graph, Karabük and Bartın population is included to the Zonguldak Population] (Anonymus, 2002). According to 2000 census of population, currently Zonguldak population is 615.599 (Anonymus, 2002).

framework as a guide to Turkish cities.

1.2. Scientific Discussion and Planning Practice for the Problem

The deindustrialization process has been the long term discussion in the scientific area. The concept of the deindustrialization process usually constitutes a repetition of previous solutions. Current approaches to shrinking cities fail to create innovation and to analyze spatial data in an accurate manner. The general common categorizations of shrinking solutions are grouped under the ecological, economic and social components. In addition, academic studies need to cover the context of spatial data analysis for the abandoned areas. The primary focus of Brownfield redevelopment is still on economic benefits integrated into the regeneration solution. Therefore, spatial information does not present itself as an important consideration in urban regeneration areas.

The general layout of the scientific background emphasizes economic, social and ecological directions in the abandoned areas. Even so, academic discussions are mostly about the economic importance of Brownfield areas. According to Langstraat (2006), Bell & Morse (2003) argues that provided the land areas required to support a city do not suffer from resources degradation, pollution or negative socio-economic impact, the city can be said to be sustainable. The investigation of Bell & Morse defines basic sustainability indicators of Brownfield areas and shows that the economic issues are one of the most important indicators of shrinking development. According to Paull (2008), economic development constitutes employment gains, leveraged investment, and revitalized neighborhood in Brownfield redevelopment. In his study, Paull determines the key role of economic development for Brownfield areas. According to Hudak (2002), generally, the willingness of a developer to get involved with a Brownfield site depends on what they perceive as the potential economic benefit (HULA, 2000). According to many scholars, main approaches to Brownfield redevelopment are based on economic benefit. However, spatial analysis should be part of the solution as well as ecological, economic and social components in order to find appropriate solutions for the shrinking problem.

Many recent studies have focused on economic, ecological and social techniques for the abandoned areas. Brownfield redevelopment approaches need to analyze not

only ecological, economic and social concerns, but also spatial data for appropriate solutions in abandoned areas. Spatial data highlights the characteristics of the abandoned areas in the Regeneration projects.

One of the major problems of the urbanization process is the impacts of the shrinking problem on the urban development. Master plan is prepared for town and cities, emphasizing zoning regulation for judicious use of urban land [9]. Therefore, master plan provides a special structure for urban regeneration projects. It addresses premise of abandoned areas in urban design implementation. Urban design discusses the issues of political, social, administrative, economic and physical structures. Urban shrinkage is one of the pathway urban developments in the planning process (RINK, HAASE, GROßMANN, BERNT, 2010). Urban design provides a direct link to the solution for abandoned areas within urban regeneration projects. The framework for urban design in urban regeneration, therefore, should be based on regeneration principles of urban design which highlight the process by which the built environment is created and which can also be integrated with urban regeneration strategies (WANSBOROUGH and MAGEAN, 2000). There is indeed a strong role for the design of the physical environment-urban and landscape design-in abandoned areas (BETRAM and NEUSTUPNY, 2005).

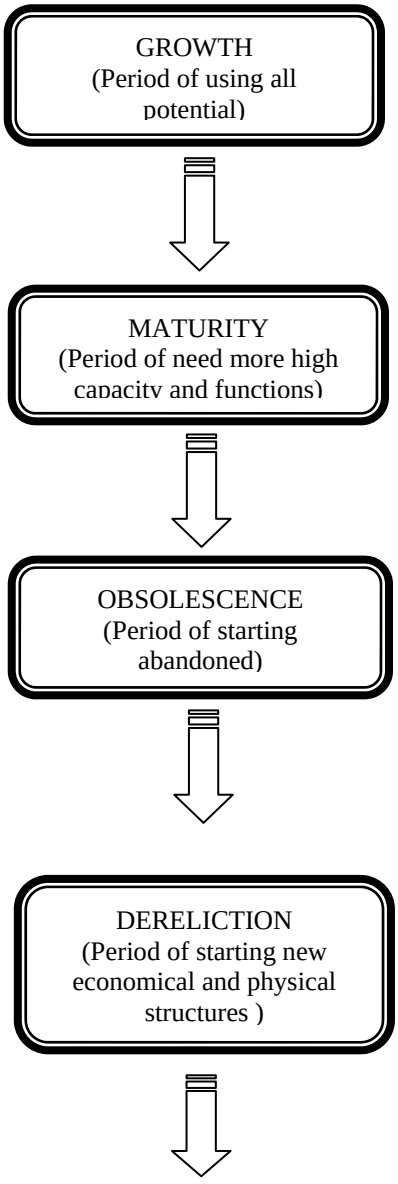
In general, this body of urbanization provides critical perspectives on the intersection between urban design and urban regeneration (SWILLING, 2005). It is clear that urban regeneration has important priorities to restore social, cultural and spatial destruction and values as well as industry and employment opportunities of cities (YIRMIBEŞOĞLU and YIĞITER, 2003).

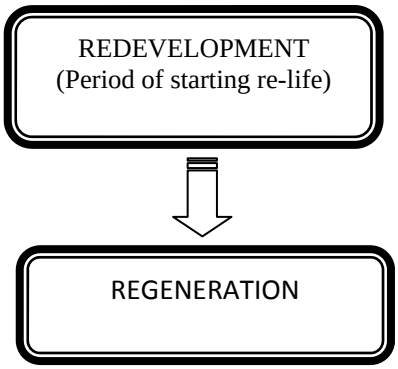
The changing socio-economic conditions lead to unemployment and adverse economic conditions in postindustrial sites. This is increasingly becoming an important problem in the urban development. Furthermore, the issue pertinent to the role of abandoned areas in urban regeneration is considered as a vital development option for healthy and livable sustainable areas.

The main aim of urban regeneration is to assess wide topics in the solution for abandoned areas. Abandoned sites penetrate into every aspect of development

options in urban areas for various reasons. "*The issue of abandoned mines is important because it represents many thousands of former mining sites that continue to pose a real potential threat to human safety and health and environmental damage"* (ZYL et al., 2002). These challenges highlight associated economic, ecological and social issues into the regeneration process. The strategy of urban regeneration of Brownfield sites proves to be a successful approach to in the cities. There are basically many processes of the urbanization problems. The current tendency is to use regeneration as a solution for the abandoned areas thanks to both its sustainable components and its structure. The regeneration process of urbanization can be summarized briefly as follows (Figure-1.4);

Figure -1.4: Regeneration Development Process





Source: Erden, 2003

The environmental, economic and social dimensions are combined in regeneration solutions. The regeneration of an urban environment contributes to a sustainable urban development in abandoned areas. In this respect, successful Brownfield redevelopment policies and strategies should use a combination of environmental, spatial and urban planning approaches (GRIMSKI and FERBER, 2001). Cities appear to be important locations for setting up actions to help urban design and urban planning strategies for sustainable development (JENKS at al, 1996; MIRZA, 2010). The general approach recommended is that urban regeneration ensures environmental restoration, sustainable land use approaches and economic development. The political, social and economic context of Brownfield becomes clearer through the analysis of related aspects in the following areas (FERBER and GRIMSKI, 2002);

- *"Breakdown of economics,*
- *Problems in attracting new investors,*
- *High unemployment rate,*
- *Decline of tax income for the communities,*
- *Social conflicts,*
- *Consumption of Greenfields."*

Abandoned industrial areas clearly originate in former industrial areas. However, the tendency to create sustainable urban regeneration especially in former industrial areas presents itself with the regeneration in these areas. The tendency of regeneration projects requires strong coordination among economic, ecological and social components. A key theme that emerges is the regeneration projects to play a

crucial role in Brownfield redevelopment. Along with Brownfield sites, upgrading of sustainable approaches creates new development options with regeneration projects in cities. In general, overall development of this process is to formulate mainly economic, ecological and social issues. There are indeed drastic effects on spatial structures for former industrial areas. The effects of spatial structure need to be analyzed in the regeneration projects for appropriate solutions in abandoned areas. The processes of shrinking cities are currently one of the important problems in developed countries. Furthermore, the abandoned solution must highlight that spatial data analysis is a necessary precedence for achieving appropriate development.

The structural problem in shrinking cities must be considered significant towards a solution for abandoned areas. The main aim of the regeneration approaches to abandoned areas is to find suitable adaptation to sustainable development in an urban planning practice. On the contrary, shrinking cities provide opportunities for new development for each abandoned area.

This study regards social, economic and ecological development as vital elements of the qualitative analysis (SWOT analysis). Additionally, Brownfield areas and their characteristics are recognized as another vital element for solutions for of Brownfield areas through the quantitative analysis. The combination of quantitative and qualitative methods offers a more efficient spatial data analysis and accurate results for abandoned areas. This analysis provides a new approach to Brownfield areas through quantitative and qualitative methods. Both quantitative and qualitative methods can be used throughout the planning practice.

1.3. Objective of the Study

The objective of this study is to investigate the Brownfield redevelopment process. It integrates SWOT and Grid Based Modeling with Hierarchical Cluster Analysis into the new methodological approach in the abandoned areas. Each method contributes to appropriate solutions for Brownfield redevelopment. The analysis concluded that sustainable development options should be emphasized in solution approaches. The design decision model provides a guide to proper solutions in abandoned areas. Green areas standards can help address concerns about the implementation of the design decision model in regeneration projects. The design decision model will

mainly prove to be the appropriate solution for sustainability in the abandoned areas. The interaction between Brownfield areas and city development underlines some key problems within the globalization process. In the context of Brownfield for Turkish cities, several problems might reasonably be exposed;

1- Economic dimension is decreased in the cities because of the Brownfield problem,
2- Cities cannot maintain their population during the process of globalization development , people migrate to other cities,
3- Cities cannot participate in the globalization context and need a solution in order to compete with other cities.

Shrinking is a problem in the urbanization process due to the economic decline and unemployment condition. These conditions might result in many other problems related to health and safety (MEHTA, 2006). Many cities have suffered from tremendous population loss during the deindustrialization process (MEHTA, 2006). In practice, urban regeneration is used in order to restore the unemployment levels and lower economic data. Urban regeneration is considered the full contribution of environmental, economic and social issues. Additionally, the spatial analysis is required for an appropriate solution for abandoned areas.

Bad image clearance and redevelopment are the most visible components of urban regeneration (GIBSON and LANGSTAFF, 1982). It should be noted here that the context of this study has increasingly linked the sustainability of economic activities and environmental improvements with social and cultural vitality (CALANTONIO and DIXON et al., 2009).

Urban regeneration makes an attempt to recover the inhabited environmental quality in order to improve the quality of human life (PAULA SOUZA GUIMARÃES and DOLORES ALVES COCCO, 2005). The urban environment is considered as an important component for the issue of sustainable development. The fundamental objective of urban regeneration is to implement sustainable principles in the abandoned areas. The powers and procedures currently used in the clearance and redevelopment process are the result of the need for a long term of evaluation of

solutions (GIBSON and LANGSTAFF, 1982).

Urban regeneration creates healthy and safety approaches regarding the response of sustainability. A particular challenge of the sustainability is to ensure an appropriate solution in abandoned areas. This process includes the linkage between the micro level of planning process and the macro level of the planning process. The content of this linkage is complex in terms of triggering environmental, economic, social and spatial planning effects (FERBER and GRIMSKI, 2002). Key measures include strategies of abandoned areas and it has a goal to achieve sustainable and healthy development in the abandoned areas.

These activities, preceding the actual development work, aim at clarifying the sustainability problem and at generating an appropriate solution idea (VAN DEN AKKER, 1999). The general objectives of this study can be listed as follows;

- Improving sustainable environment in abandoned areas
- Restructuring and regaining the derelict areas
- Recognizing the potential of abandoned areas and identifying the existing resources
- Creating healthy built environments and landscapes for present and future generations
- Providing sustainable land development in urban areas
- Integrating a holistic approach into the urban regeneration in Brownfield sites

Former coal mining sites of Zonguldak demonstrate that spatial analysis must be focused on with social, economic and ecological analysis. One of the main problems facing former mining sites is the steady loss of residents and jobs over the last decades (FRIEDMAN, 2003). The problem of with the closure of mining areas, where redevelopment is complicated by environmental contamination, has great impacts on Zonguldak (SMITH, 2010). The Zonguldak population movement is towards other cities due to a lack of economic opportunities. The constraints of the economic level of a shrinking city`s development can be defined as a crucial problem in the city. Furthermore, the solution for this problem is reflected on alternative approaches to urban development strategies. The nature of development in abandoned areas is

generally associated with physical clearance. The purpose of this study is to examine the impacts of both social, economic, ecological factors and spatial factors in order to find an appropriate solution for Brownfield redevelopment. In this study, a detailed analysis is conducted for Zonguldak city in local level by using the method of Grid Based Modeling with Hierarchical Cluster and SWOT. The cultural and historical components allow us to define the advantages and disadvantages of social SWOT analysis in this study. The natural components are the main focus of the method that helps to analyze both quantitative (Grid Based Modeling with Hierarchical Cluster Analysis) and qualitative (SWOT) method. Natural components prove that SWOT analysis and Grid Based Modeling with Hierarchical Cluster analysis work as one method for urban regeneration approach.

Finally, the top-down approach in urban regeneration is needed to conduct an overall analysis of the abandoned areas. This study provides a case study of the urban regeneration in Zonguldak for an appropriate sustainable solution. It employs qualitative and quantitative methods as a solution for the abandoned areas in the regeneration projects. The design decision model could satisfy city development needs.

1.4. Emphasis of the Investigation

This investigation puts emphasis on the key role of spatial characteristics in new planning and design approaches. In this study, the regeneration of Brownfield sites provides the balance among social, economic, ecological and spatial analyses. The regaining of Brownfield sites is a crucial strategy of planning and design in regeneration projects. The study employs an adequate analysis of the spatial data as a form of quantitative analysis. In the current land use in Zonguldak, closed coal mining sites present themselves as the kind of areas for which an attempt will be made to achieve sustainable development.

The Turkish planning system has a complex structure (TÜRK, 2002). This structure has been shaped with various planning laws from past to present (TÜRK, 2002). From this perspective, an urban regeneration project and its instruments cannot be easily adapted to the Turkish planning system. In addition, the Turkish planning policy does not have a comprehensive multi-dimensional sustainable development

strategy (MAZLUM, 2004). Admittedly, Brownfield problem focuses on economic decline and unemployment condition in the city development. It is obvious that the Turkish planning system needs a revision for a sustainable and appropriate solution in abandoned areas.

Currently, Zonguldak is faced with inevitable threats of an abandonment problem in the city development. These threats have enormous impacts on economic decline, social destruction and environmental demolition. The study uses qualitative and quantitative analyses in order to place emphasis on a systematic approach to such threats. The main objective of the urban regeneration implementation is to regain these underuse areas. Redevelopment of potential abandoned areas reveals instruments of new development options in the city. These instruments of urban regeneration are restricted due to the limitation of the accessible data on the abandoned areas.

The efficient and optimum utilization of former coal mining areas is top priority in all development options [10]. The present state of abandoned areas has a key role in new development potential in Zonguldak. The dramatic development in former coal mining areas brings about inevitable results of destruction on social and economic development. Regaining former coal mining sites is a long term development with adaptation to the Turkish planning system. The concept of urban regeneration is increasingly included in urban development content. The main purpose of this study is to determine practical solutions of urban generation for a sustainable approach.

1.5. The Subject of The Study

City shrinkage is the result of globalization and its effects are reflected in the relocation of industry and the development of urbanization (SABOT and FOL, 2007). Although globalization has helped new development in some cities, others are undergoing a destructive influence on the city development. The particular problem of shrinking cities is enormous decline in the industrialized areas.

"The renovation of derelict industrial sites is a longstanding and widespread practice and has become more popular in the last decades of the 20th century" (MIAZZO, 2009). The most important consequence of the solution is functional transformation

from industry to park, leisure or settlement facilities. While city shrinkage is a common phenomenon in developed countries, it affects a variety of issues depending upon urban development context (SABOT and FOL, 2007). For example, the socio-economic restructuring that has taken place in British cities over the last century has led to a more complex mosaic of British economy and industrial areas (WONG, BAKER, GALLENT, 2004). According to Wong et al. (2004), the national market, for instance, has been characterized by a reduced demand for traditional skilled manual labor (GREEN, 1997). The huge loss of employment is the main reason for abandoned problem in developed countries.

In some British cities such as Manchester, urban areas evolved rapidly in the early 19th century from series of small towns to a major industrial conurbation with huge material flows and worldwide trade connection (DOUGLAS, HODGSON, LAWSON, 2002). On the contrary, today those cities are suffering from population decline, economic destruction and social collapse in the urban development.

Currently, urban development is inevitably faced with the drastic abandoned conditions in former industrialized areas. It is important to emphasize regeneration projects as a common solution approach in abandoned areas in developed countries. The abandoned structures are constructed as new facilities through urban regeneration projects in the urban development.

Developed countries have preserved enhancing life style, historical background of abandoned areas in the regeneration projects. The urban regeneration projects require the instruments of urban design to be firmly derived from the demands of urban abandoned areas (WANSBOROUGH AND MAGEAN, 2000). According to Wansborough and Magean (2000), the use of regeneration of post industrial sites is linked to urban design through the process of creating what is known as the “entrepreneurial city” (HALL and HUBBARD, 1996).

The objectives of urban design include the implementation of urban regeneration projects in the planning development. Urban regeneration uses three forms of sustainability context. These are economic viability, social benefit and environmental support. According to Carmona et al. (2002), there is an obvious relationship

between the three forms of urban regeneration and urban design objectives; the relationship is explained in a figure from the study conducted by Carmona et al.;

SUSTAINABLE VALUE

A. Economic viability B. Social benefit C. Environmental support

Character-to promote character in townscape and landscape by responding to and reinforcing locally distinctive patterns of development and culture.

Continuity and Enclosure-to promote the continuity of street frontages and the enclosure of space by development which clearly defines private and public areas.

Quality of the Public Realm-to promote public spaces and routes that are attractive, safe, uncluttered and work effectively for all in society, including disabled and elderly people.

Ease of Movement-to promote accessibility and local permeability by making places that connect with each other and are easy to move through, putting people before traffic and integrating land uses and transport.

Legibility-to promote legibility through development that provides recognizable routes, intersections and landmarks to help people find their way around.

Adaptability-to promote adaptability through development that can respond to changing social, technological and economic conditions.

Diversity-to promote diversity and choice through a mix of compatible developments and uses that work together to create viable places that respond to local needs.

A. Economic Viability- development that is economically feasible and which

remains economically viable over the long-term

B. Social Benefit- development that responds to broader public objectives and concerns and which as far as possible benefits from the support of the local community in which it sits

C. Environmental Support- development that delivers more energy efficient, robust, ecologically supportive and less polluting patterns of urban form

The notion of urban regeneration promotes new instruments of sustainable development in the urban design implementations. These instruments are also closely intertwined with criteria for urban design in the urban regeneration projects. The reason why criteria for urban design are used is that Brownfield sites need an immediate solution, for there are drastically negative effects on land use development.

A definition of design is outlined and then utilized in an assessment of a number of abandoned areas design on the urban regeneration schemes (BELL and JAYNE, 2003). The transformation processes of abandoned areas are long and complex, and have been parallel to the countries economic, social and ecological transformation (STANGEL, 2011). The requirement of urban design instruments must be a suitable framework to address urban regeneration in abandoned areas.

1.6. Focus and Methodology of the Study

The methodology of the study was established with a consideration into nature, culture and history in the derelict areas. The instruments of urban and landscape design are priority to improve sustainable development in the abandoned areas. The methodology employs not only a qualitative analysis but also a quantitative analysis for a proper solution in abandoned areas. In this study, historical, cultural and natural components are in compliance with sustainability instruments.

The focus of Brownfield redevelopment must be on the characteristics of abandoned areas in the regeneration projects. An assessment of the characteristics of abandoned areas is conducted in order to determine potential impacts of design solution on the city development.

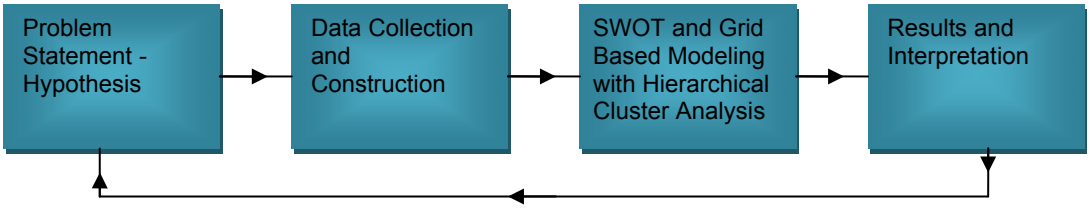
The analysis included in the study find a solution for negative impacts of derelict areas and thus promotes healthy development. The primary methodological focus of post-industrial landscape is on conducting an analysis of the required approaches that are not included in current solution experiences. The main purpose of the methodology is to conduct a detailed analysis from down scale to top scale as a new method for the abandoned areas. This new methodological approach is first used in one Turkish city, and it is considered to be a unique approach when combined with the analysis of the case study. Additionally, many scientific methods adopt bottom-up or top-down approach but they generally have the lack of necessary understanding of the characteristics of Brownfield areas or Brownfield effects on the city development.

For instance, U.S. Environmental Protection Agency (EPA), in 1997, described bottom-up planning process as *"Bottom-up planning process has involved many local business as well as neighborhood residents"*. According to John Byrne et al. (1999), bottom-up process is determined as follows; *"A bottom-up process that proceeds from a community based vision of its needs and aspiration. It seeks to build capacity, create partnerships and mobilize resources to make a vision a reality".* All of these approaches have been focused on public participation and public demands in the urban regeneration of implementation. However, the methodology of this study brings new attempts in terms of analyzing land data (quantitative analysis) and Brownfield effects (qualitative analysis) on the city development. The other advantage of this method is that it gives a chance to make decisions about the design for Turkish cities. The methodology in the study could conduct a powerful and detailed analysis in abandoned areas. The design decision model, one of the new approaches in Brownfield redevelopment, will become an important tool of design preparation in regeneration projects. Post-industrial structures have a great potential for reuse and bring new identity to the derelict areas in the design approaches.

In this study, Brownfield areas are the core problem of the city development, which is based on my hypothesis to find an appropriate solution to this problem in the urban regeneration context. SWOT (Strength, Weakness, Opportunity, Threat) analysis can explore top scale of the issue to understand the general problem in the city development. Additionally, Grid Based Modeling with Hierarchical Cluster Analysis examines the characteristics of abandoned areas (micro scale of the issue) such as

slope, land use issues in the methodological approach. The study concludes with an interpretation of the design decision model (Figure–1.5).

Figure -1.5: Linkages of the Research Method



Source: Adapted from ROBINSON, 1998

The process includes qualitative and quantitative analyses to deal with the critical problem of abandoned areas. Basically, it is a process that employs new methodology to help sustainability and determine the extent and corrective action [4]. The methodology emphasizes particular solution approaches that could be integrated into the scientific background.

The main principals of the methodological approach in the study are [11];

- To analyze and evaluate current practice in Brownfield regeneration
- To derive improvements for the applied procedure
- To define the criteria for sustainable Brownfield regeneration

The main objective of the methodological approach to Brownfield redevelopment is to encourage beneficial use of abandoned areas in the city development. Urban planning instruments are used to promote preventive and intervention measures (MEDA, 2009) in the derelict areas. Spatial development perspective provides sustainability regarding environmentally sensitive, economically viable and socially acceptable development in this research.

The methodology makes a constant attempt to compromise between urban design and urban regeneration and reinterpret the concept to support the objective of sustainable development (COUCH, DENEMANN, 2000). Furthermore, the methodology includes a new scientific approach to abandoned areas in sustainable

development. This study provides a detailed analysis for an overview of the problem solution.

Urban development is focused on many widespread problems. The shrinking problem is currently considered one of the most important problems in cities. Brownfield redevelopment highlights sustainability in the solution for the shrinking problem. Brownfield redevelopment process at the project level represents a summary of some fundamental premises [4];

- *"Achieving sustainable development at the community and Brownfield project levels will require changes based on the expectations of communities and balance between community and sustainability parameters.*
- *Brownfield projects need to be evaluated in social life and in local sources because what is sustainable in one community may not be in another.*
- *Sustainable regeneration redevelopment should be concentrated on the urban derelict areas that may affect current and future site conditions".*

The main focus of the study is on finding an appropriate solution for the shrinking problem and its impacts on the urban environment. Local and regional economic developments have changed considerably in the globalization process. In this process, cities have regenerated the new infrastructural conditions of the local developments (LEVENT, 2003). Urban regeneration has mainly concentrated on social, economic and demographic structures for sustainable development.

The quantitative and qualitative analyses are conducted so as to examine the shrinking problem thoroughly within the case study of Zonguldak. This study will help to develop a conceptual model that can guide the sustainable development for Turkish cities. Additionally, it will emphasize a new methodological approach to Brownfield redevelopment through SWOT analysis and Grid Based Modeling with Hierarchical Cluster analysis. The design decision model of Brownfield areas will be tested in a way sustainable with approaches to precise solutions in abandoned areas. The methodology used in this study is based on green areas standards of the land use for the design decision model. In addition, the methodology can mainly test any kind of standards for approaches to design for problem solution.

2-URBAN REGENERATION PROJECTS IN THE DERELICT AREAS

As a result of centuries of human exploitation of our planet, the phenomenon of the industrialization process has become littered with tens of thousands of acres of abandoned, decaying, and potentially contaminated former industrial sites (VEY, 2007; LEWIS, 2008). Additionally, industrialization process started to lose significant effect in the urbanization development. A vigorous development of deindustrialization causes economic decline and unemployment condition in the city development. Developed countries are currently faced with sufferings mostly from deindustrialization conditions. According to Lewis (2008), the USA has approximately five hundred to one million Brownfield sites (AMEKUDZI and FOMUNUNG, 2004). Potential impacts of increased deindustrialization are the abandoned problem, vacant homes and high unemployment rates in the cities.

The deindustrialization process is certainly connected with transformation of structures and functionality that encourage sustainable development. Former coal mining areas are the strongest proponents of this structuralist explanation, predicting a linear and positive relationship between the magnitude of deindustrialization and expansion of sustainable components (IVERSEN and CUSACK, 2000; CARNES and MARES, 2010). The regeneration of these derelict areas provides new development opportunities for the neglected city centers and their surroundings to recover the social life and utilization of city centers (THORNS, 2002; YERLIYURT and HAMAMCIOĞLU, 2005). The social, economic and ecological components are the most inevitable approach to Brownfield redevelopment in this process. Brownfield redevelopment constitutes a widespread solution for economic, ecological and social components, but there is a lack of spatial analysis evaluation of the derelict areas problem.

The abandoned areas are more often considered in regard to sustainability in developed countries. A prerequisite of Brownfield redevelopment must be to adapt a new methodological approach integrated into the regeneration approaches. The indispensable approach to regaining abandoned areas is that it is necessary to analyze abandoned industrial areas for redevelopment through the best possible approach. This study proposes a new solution through a new method of analysis for

Brownfield areas. In the study, the quantitative and qualitative analyses will serve as a guide to a new approach to an appropriate solution for abandoned areas.

2.1. An Evaluation of the Urban Regeneration Projects, Brownfield Problem and affects on Life Style

This section includes information about urban regeneration projects and its impacts, and current solution approaches to the abandoned areas. The process of deindustrialization has an enormous influence on the structure of social, ecological and economic development in the cities. The deindustrialization process results in massive damage to the economic and social development. Urban regeneration is widely experienced in abandoned areas (ROBERTS and SKYES, 2000; FRIESECKE, 2007). Basically, urban regeneration makes efforts to regain abandoned structure in the planning process.

In effect, cities must face up to some major challenges related to social, economic, environmental and multi-cultural aspects [12]. Currently, urban growth is replaced by stagnation and shrinkage process in many places in developed countries (KABISCH et al., 2006; FRIESECKE, 2007). Urban regeneration is indeed a solution for shrinking and the deindustrialization process in the city development.

Generally, the primary objectives of urban regeneration can be specified in the following categories (FRIESECKE, 2007);

- Strengthening and supporting the vitality and economic functions of such districts as well as
- Renewing and preserving their building stock as well as their urban physical and social structure
- Improving the natural conditions of Brownfield areas for sustainable and healthy development.

Population and economic decline seems to be a kind of focal point of development of shrinking cities (GROßMANN et al., 2008). Solution for the shrinking problem by means of urban regeneration implementation is relocated requirement of sustainable components. Regeneration projects represent the only solution that could be

integrated into the process of the recovery of abandoned areas. It reveals the consequences of regaining the abandoned areas in the urban planning development. The urban regeneration aims to coordinate the component of sustainability to regain the abandoned areas in cities.

The concept of the shrinking cities is currently core of the robust problem in the city development. Impacts of shrinking cities include contaminated sites, enormous unemployment conditions, and derelict areas. Urban regeneration emerges as an important approach to solutions for shrinkage development. According to Keleş (2003), urban regeneration can be defined as a conscious, systematized and planned action concerning a certain section or totality of a town. Urban regeneration could prove to be a solution for the shrinking problem as follows [11];

- *"Real or perceived contamination problems, environmental risks*
- *High local unemployment*
- *Adverse effects on urban life and the viability of communities*
- *Decreasing social stability, increasing social conflicts"*

A significant and increasing number of abandoned areas are threatening the safety of surrounding areas, contamination and negatively affecting the view of the city (ZOOK, 2009). These problems are crucial in the areas with high concentration of former industry (FUHR, 1999). The process of urban regeneration is increasingly becoming the major solution for the abandoned areas. A particular characteristic of the regeneration approach is that it helps to develop a new sustainable approach for abandoned areas. Urban regeneration must provide an extensive approach to the solution for abandoned areas. The main purpose of urban regeneration is to provide sustainability in the abandoned areas.

2.2. Why Sustainability is Necessary for Brownfield Areas

Over the course of the 20th century, cities in developed countries suffered from the loss of traditional industries that were undercut by cheaper products from East Asia or withered by the decline in colonial power (JONES and EVANS, 2008). Cities are currently suffering from the process. Nevertheless, the process provides

opportunities for solutions for sustainable development through urban regeneration approaches. Developed countries can have problems with controlling adverse development in deindustrialization areas. Adverse effects assessment must include an evaluation of sustainability in the urban planning process. In this context, it should be noted that Brownfield redevelopment uses urban regeneration with sustainability components. There should be a remarkable coordination between sustainable components and the prerequisite of abandoned areas in order to be able to regain the derelict areas. There is a set of main arguments in support of these approaches to urban regeneration (MCARTHUR, 1995; SKELCHER et al., 1996; LOWNDES et al, 1997; VILAPLANA, 1998) which are related with ecological, economic, social indicators.

Many of the urban regeneration approaches include key objectives related to sustainable structural urban planning implementations, such as (GRIMSKI and FERBER, 2001);

- *"Restricting "land-take" by Greenfield site development by reusing Brownfield;*
- *Preserving the architectural heritage of industrial revolution by finding new uses for historic industrial buildings;*
- *Increasing the skills of unemployed people, for example, via the creation of employment opportunities;*
- *Improving environmental quality, for example by encapsulating or removing contaminated soil and restoring the landscape damaged by industrial use."*

These strategies are the target objectives of urban regeneration. Urban regeneration addresses reconstruction of both social and physical values in order to provide sustainability. The process of deindustrialization is the reason for derelict areas that helps to improve sustainable development in the urban regeneration scheme.

The concept of urban regeneration and its specifying content should examine sustainable development on the impact of transformation process. "*The concept of sustainable development dates back a long way, but it was at the UN Conference on*

the Human Environment[4] *(Stockholm, 1972) that the international community met for the first time to consider global environment and development needs together"* [13]. This conference put particular emphasis on sustainability in social and economic development.

In 1987, the concept of sustainable development was defined by the report "Our Shared Future"[5]. According to this report, "*sustainable development is the meeting of present needs without restricting the ability and means of future generations to provide for their needs"*. In this definition, sustainability can take into consideration the needs of future generations and the ensure aims of compliance on the economic, social, ecological dynamics.

In 1992, the concept of sustainable development was emphasized in the Rio de Janerio[6] declaration on Environment and Development. The consensus of the conference was declared as Agenda 21, in reference to the 21st century, and the following targets were revealed;

- Distribution of social justice and equal rights
- Economic compatibility
- Ecological resistance
- Secured future

In 2003, the European Council of Town Planner focused on sustainability in city development and New Athens Charter was prepared by the European Council of Town Planner, which dealt with the sustainable management system within following approaches [14];

- *"Social balance, involvement, multi-cultural richness connections between generations, social identity, facilities, services*
- *Globalization/regionalization competitive advantages, city networking: complementary and co-operation, economic diversity, mobility*

[4] For more information look at "http://en.wikipedia.org/wiki/United_Nations_Conference_on_the_Human_Environmen"
[5] For more information on Brundlant Report look at "http://en.wikipedia.org/wiki/Brundtland_Commission"
[6] For more information look at "http://en.wikipedia.org/wiki/Earth_Summit"

- *Input-output, ecosystem approach, healthy cities, nature landscape and open spaces, renewable energy, risk and hazard protection*
- *Urban design, genius loci, cultural heritage, public spaces, local identity, personal contacts, aesthetic excellence"*

Urban regeneration makes an effort to incorporate economic, ecological and social aspects of sustainable development in terms of regaining abandoned areas. For example, the UK government reorganizes the planning and housing issues that are especially focused on the sustainable society theme. In England, the Prime Minister established a group of experts on the sustainable society formation that prepared Egan Report (2004) and produced the sustainable communities' components for sustainable development;

Table-2.1: Sustainable Communities' Components

SOCIAL and CULTURAL	➢ A sense of community identity and belonging ➢ Tolerance respect and engagement with people from different cultures, background and beliefs ➢ Friendly co-operative and helpful behavior in neighborhoods ➢ Opportunities for cultural, leisure, community, sport and other activities ➢ Low levels of crime and anti-social behavior with visible, effective and community-friendly policing ➢ All people are socially included and have similar life opportunities
GOVERNANCE	➢ Strategic, visionary, representative, accountable governance systems that enable inclusive, active and effective participation by individuals and organizations ➢ Strong, informed and effective leadership that lead by example (eg government, business and community) ➢ Strong, inclusive, community and voluntary sector (eg resident's associations, neighborhood watch) ➢ A sense of civic values, responsibility and pride ➢ Continuous improvement through effective delivery, monitoring and feedback at all levels

ENVIRONMENTAL	➢ Efficient use of resources now and in the future in the built environment and service provision (e.g. energy, land, water resources, flood defense, waste minimization etc) ➢ Living in a way that minimizes the negative environmental impact and enhances the positive impact (e.g. recycling, walking, cycling) ➢ Protecting and improving natural resources and biodiversity (e.g. air quality, noise, water quality) ➢ Having due regard for needs of future generations in current decisions and actions
HOUSING and BUILT ENVIRONMENT	➢ Creating a sense of place (e.g. a place with a positive "feeling" for people, and local distinctiveness) ➢ Well-maintained, local user-friendly public and green spaces with facilities for everyone including children and older people ➢ Sufficient range, diversity and affordability of housing within a balanced housing marketing ➢ A housing quality well-designed built environment of appropriate size, scale, density, design and layout that complements the distinctive local character of community ➢ High quality, mixed-use, durable, flexible and adaptable buildings
TRANSPORT and CONNECTIVITY	➢ Transport facilities, including public transport, that help people travel within and between communities ➢ Facilities to encourage safe local walking and cycling ➢ Accessible and appropriate local parking facilities ➢ Widely available and effective telecommunications and internet access
ECONOMY	➢ A wide range of jobs and training opportunities ➢ Sufficient land and buildings support economic prosperity and change ➢ Dynamic job and business creation ➢ A strong business community with links into the wider economy
SERVICES	➢ Well-educated people from well-performing local schools, further and higher education and training for lifelong learning ➢ High quality, local health care and social services ➢ Provision of range of accessible, affordable public, community, voluntary and private services (e.g. retail, food, commercial, utilities) ➢ Service provider who think and act no long term and beyond their own immediate geographical and interest boundaries

Sources: EGAN, 2004

The concept of sustainable development has become one of the main approaches of the 21st century (CHITENGI, 2003). The sustainable development covers all stages

of development and progress throughout the process of urbanization. Urban regeneration also needs to address sustainable development in the abandoned areas. An important theme of sustainable development is the important role of social and physical regeneration in the derelict areas.

2.3. Visual Aspect of Urban Regeneration Areas for Urban and Landscape Design

Brownfield Planning applies methods and technologies which clean up abandoned former industrial land to development of plans for urban regeneration (SMITH, 2010). Landscape variety, landscape beauty and landscape uniqueness are a basis for both recreation of humans in nature and the leisure industry as a branch which is becoming more and more important in urban regeneration (GRUEHN and ROTH, 2008). There is a consensus that visual landscape assessment is an inevitable component of landscape and environmental planning (GRUEHN and ROTH, 2008).

Analysis of the impacts of abandoned areas presents visual problems in the city development. In this context, visual approach and the fundamental principles provide sustainable development into the urban regeneration implementations. Visual assessment of abandoned areas proves to be an important content of the regeneration projects.

The concept of urban space can be defined, without imposing aesthetic criteria, as all types of space between buildings in towns and other localities (KRIER, 1979). This space is shaped geometrically and it is only the clear legibility of geometrical characteristics and aesthetics qualities which allows us consciously to perceive external space as urban space (KRIER, 1979). The basic approach of urban regeneration takes care of aesthetic and visual perception for design in urban development. Elements of visual design should provide a functional and sustainable design for the urban space of Brownfield areas.

Ecological process interacting with natural processes is not consciously planned or designed with any aesthetic objective in urban space, but more specifically designed to appeal to our aesthetic senses (BELL, 1993). Evaluation of abandoned areas is

not static in design approach. Abandoned areas of hills, water, vegetation and buildings provide different landscape patterns in urban and landscape design depending on visual perspective. Understanding of the environmental visual qualities and landscapes can be analyzed in a fundamental and a rational manner (BELL, 1993). The patterns are formed from different design components, but visual design can be created through basic elements for Brownfield areas. According to Bell (1993), visual design has four basic elements; a point, a line, a plane and a volume, each of which is explained as follows;

A-POINT

A point, strictly speaking, has no dimension but marks a position space in the visual approach (BELL, 1993). Small or distant objects may be regarded as points such as a bale of straw, a lone tree or small distant objects (BELL, 1993). Point has been defined with a particular purpose like mark out territory, to act as landmarks, to provide a focus for a grand design or merely to provide an interest in a featureless landscape (BELL, 1993). Bell (1993) defines point as follows;

- *"A point marks a position in space*
- *Small objects can be seen as points*
- *Point features can be associated with assertions of power or ownership and can be symbolic in all kinds of ways."*

B-LINE

A line is an extension of point in one dimension which can have specific properties in the way it is drawn or created such as clean, fuzzy, irregular or discontinuous (BELL, 1993). The edge or the edge of a plane can be determined as a line, and so can the boundaries between colors and textures in the design (BELL, 1993). A line can also imply a direction and force or energy in visual perspective of design (BELL, 1993). Bell (1993) defines line as follows;

- *"Extending a point in one dimension creates a line*
- *Lines can be implied by the location of points*
- *Lines can be imaginary yet still exert influence*
- *Edges of planes can be seen as lines*

- *Lines can have their own properties*
- *Natural lines are common and important in the landscape*
- *Man-made lines are also numerous*
- *Lines as boundaries are used extensively*
- *Lines can act as defining elements in architecture"*

C-PLANE

"By extending one-dimensional line into two dimensions we can form a plane" (BELL, 1993). "*It has no depth or thickness, only length and width"* (BELL, 1993), which helps to understand design areas facilities such as floor, wall or roof planes. The surface of a three-dimensional object is perceived as a plane (BELL, 1993). "*Planes can be simple, flat, curved or twisted"* (BELL, 1993). They do not need to be continuous or real, and they can be implied as in the picture plane (BELL, 1993). Planes can be used as media for other treatment and for their inherent qualities such as reflection (BELL, 1993).

D-VOLUME

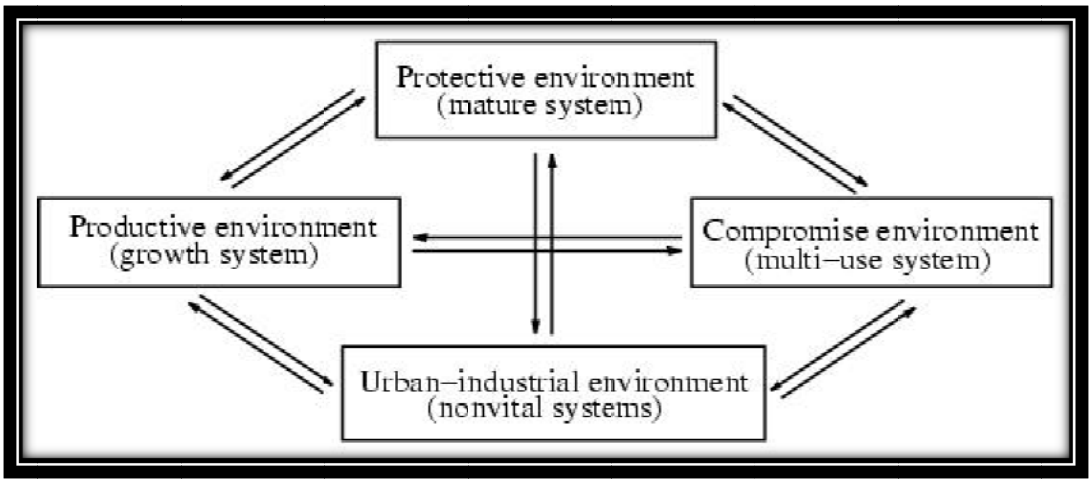
Volume is the three-dimensional extension of a two dimensional plane (BELL, 1993). Volume can be solid or open which can be shaped by a geometric form or irregular form (BELL, 1993). Buildings, landforms, trees and woods are all solid volumes-mass in space (BELL, 1993). Solid volumes can be found in geometric forms such as the cube, tetrahedron sphere etc..

These basic design elements help to analyze Brownfield areas in the design approaches. These elements are found in combination and can possibly be useful to regenerate Brownfield areas with respect for areas identity. The approach of Kevin Lynch[7] is identified as place of legibility that is essentially easy to understand the layout of a place. Brownfield areas contain many unique elements that draw design principles for the areas. Lynch uses paths, edges, districts, nodes and landmarks to create a layout for the city. This simple approach can help simply to understand areas identity. "*The urban design plan included a set of height and bulk regulation that proved its most significant practical element"* (BARNETT, 1982). The maximum height of buildings can determine the limit of the building design in Brownfield areas

[7] For more information look at the book "Image of the city" author Kevin LYNCH (1960)

which can be controlled by the shape of design in Brownfield areas.

Figure -2.1: Eugene Odum`s ecosystem compartment model (1969)



Source: [15]

According to Eugene Odum, an ecosystem is changed by a response to human actions (NDUBISI, 1997). He created a model or theory that makes clearer the functional relationships between types of ecological system required by people (NDUBISI, 1997). The model divides function of landscape characteristics into basic ecological roles: Production (e.g., agriculture, forestry); protection (e.g. wetlands, mature forests); compromise or multiple-use (e.g., suburbs under a forest canopy); and biologically non-vital uses (e.g., cities, industry) (NDUBISI, 1997). Odum`s model reveals that urban industrial environment interacts with both the ecological system and people in urban development. The new development between industrial and urban environment shows that is a post-industrial wasteland, littered with decaying factories, crumbling warehouses, boarded up commercial spaces, skeletal remains of once grand skyscraper (RAGISTAD, 2008). Visual quality must significantly take the abandoned areas design into consideration. Thus, it helps to create a new positive impact of urban development on the abandoned areas. The visual elements are the basic component of the design approach to the derelict areas. Additionally, they can prove to be a fundamental approach to a healthy and sustainable development in the Brownfield sites design. As a result, this fundamental approach provides sustainable redevelopment with visual quality assessment for Brownfield projects.

2.4. Sample Urban Regeneration Projects in the Former Coal Mining Areas

In particular, negative impacts of abandoned areas must be carefully eliminated in a way that will trigger appropriate development. Urban regeneration projects are a very common urban development tool in abandoned areas. Changing cities towards sustainability in the direction of regaining more abandoned sites requires more than focusing on rehabilitation and redevelopment (KAPLAN and TUNÇER, 2006). Urban regeneration projects should be attached with great importance in order to regain abandoned areas as a key approach in the city development.

These large post-industrial areas have complex problems that need regeneration approaches to abandoned areas. Urban regeneration is an integrative activity with strong connection to the sustainable development options (LEONARDSEN et al., 2003). The manifesto of the framework for sustainable development is rooted in an integrated area-based approach regeneration initiative combining economic, social, cultural and environmental aspects (COLANTONIO and DIXON et al, 2009). The regeneration projects focus on opportunities to provide sustainable development for the abandoned areas.

A regeneration project revitalizes both physical structures and economic, social, ecological components in order to have a successful development in the abandoned areas. Consequently, urban regeneration projects prioritize the new development option in abandoned areas.

The Description of European Brownfields

The CABERNET (Concerted Action on Brownfields and Economic Regeneration Network) has identified a Brownfield problem in Europe (OLIVER et al, 2005). This information is essential in order to understand the indicators of Brownfield areas and their potential (OLIVER et al, 2005). CABERNET determined Brownfield areas based on CALRINET definition *"Sites that have been affected by the former uses of the site and surrounding land: are derelict and underused: may have real or perceived contamination problems; are mainly in developed urban areas; and require*

intervention to bring them back to beneficial use" (OLIVER et al, 2005). The definition of Brownfield areas varies in meaning from one country to another; however, especially Germany, the Netherlands and the United Kingdom have a common approach to and understanding of Brownfield problems. According to the CABERNET research, Germany, the Netherlands and the United Kingdom define Brownfield areas as follows;

Table-2.2: The definition of Brownfield Areas in Western Europe Countries

Country	Bronwfield definition	Data Sources
Germany	Inner city buildings not under use. Inner city areas redevelopment and refurbishment	Umweltbundesamt Berlin
Netherland	No commonly recognised definition. "Obsolete industrial sites" defines in the other table	Ministry Economic Affairs
United Kingdom	England and Wales; Previously developed land-land which is or was occupied by a permanent structure (excluding agricultural or forestry buildings) and associated fixed surface infrastructure.	Planning Policy Guidance Note No:3 (PPG3) Housing DETR (2000); WELSH Assembly

Source: OLIVER et al, 2005

It can be seen from the table that Germany, the Netherlands and the UK define Brownfield areas as follows: "it is not under use or abandoned industrial sites". In this common approach, approaches to solutions are almost the same in all countries. European countries are still suffering from Brownfield areas; it is one of the main

problems in the near future all over the world as well as Europe. CABERNET investigation has shown potential Brownfield sites in the UK, Germany and the Netherlands;

Table-2.3: Potential of Brownfield Sites in Uk, Germany and Netherland

Country	**Estimated total area of Brownfield**	**Suspected/potential number of potential sites**	**Data Sources**
Germany	128,000 hectares	362,000 hectares	Umweltbundesamt Berlin (2000)
Netherland	9,000-11,000 hectares	110,000-120,000 hectares (estimated)	EEA (1999); Environmental Ministry (2000)
United Kingdom	65,760 hectares (England)	100,000 hectares (England estimates)	National Land use Database (2003 return published 2004)
	10,847 hectares (Scotland)	4,222 hectares (Scotland)	Scottish Executive (Scottish Vacant and Derelict Land Survey 2003, published 2004)
	No data for Wales and Norhern Ireland		

Source: OLIVER et al, 2005

As can be seen from the table, Brownfield is a problem not only for the present but also for the future in the city development. This point of view enables one to analyze Brownfield sites in a larger context in the solution approaches. Abandoned sites suffer from severe decline in many places in city development. A disturbance of abandoned areas in this development can create more problems in city planning.

The problems presented by at risk, vacant, and abandoned rental properties are common throughout the de-industrialization process (KEATING, 2007). A recent approach to Brownfield areas highlights economic decline, vacancy problem and unemployment condition in the city development. The shrinking problem increases in importance in the current economic development direction as a remarkable problem in the city development. Urban regeneration projects have increasingly become a central solution for abandoned areas in developed countries. The long term benefits of these projects can help to guide future approaches to and implementations in the Brownfield issue.

Urban regeneration projects reveal that most of the implementation is dominated by economic, ecological and social aspects of the abandoned areas development. The urban regeneration projects increasingly tend to transform abandoned areas from former industrial areas to public use areas (table 2-4).

Table-2.4: Transformation of Functions from Former Mining Areas

FORMER FUNCTION	NEW FUNCTION
Manvers (Rotherham) Mine in U.K.	Business Park
Oranje-Nassau Mine in Netherland	Neighborhood and Public Use Areas
Duisburg Nord Mine in Germany	Landscape Park
Zollverein Essen	Public Use Areas such as museum, restaurant etc…

Source: Mustafa ERGEN, 2011, (Author`s own construct)

Aims of the Projects

The principal aim of these projects is to regain the loss functionality of mining areas with new functions into the urban development. The main objectives of the projects are to promote development and provide sustainable environment in the abandoned areas. These objectives can be summarized as follows;

- Revival and regaining cultural sense of the areas are realized in this vision.
- Adverse environmental conditions need to be eliminated from the areas.
- Creation of effect to revitalize the old fabric

There are many different approaches to solutions for abandoned areas, but the regeneration projects have generally the same ultimate goals [16]. Brownfield Redevelopment projects show that each project goes through specific phases which are effectively the same for all projects irrespective of their type and scope (GRIMSKI and FERBER, 2001). Brownfield Redevelopment projects have been defined in many ways, so it is useful here to briefly depict the common understanding of these approaches (SKERRITT-ZUBER, 2001).

All urban projects point out that the precondition of projects is an accordingly target-oriented basic attitude and conviction that must be present in all concerned parties [17]. Brownfield redevelopment projects work with sustainability to test alternative approaches and regenerate abandoned areas across cities. Urban regeneration projects that prove to be sustainability viable to develop show sustainable strategies exploit the opportunities that they must achieve in abandoned areas (GROENENDIJK, 2006).

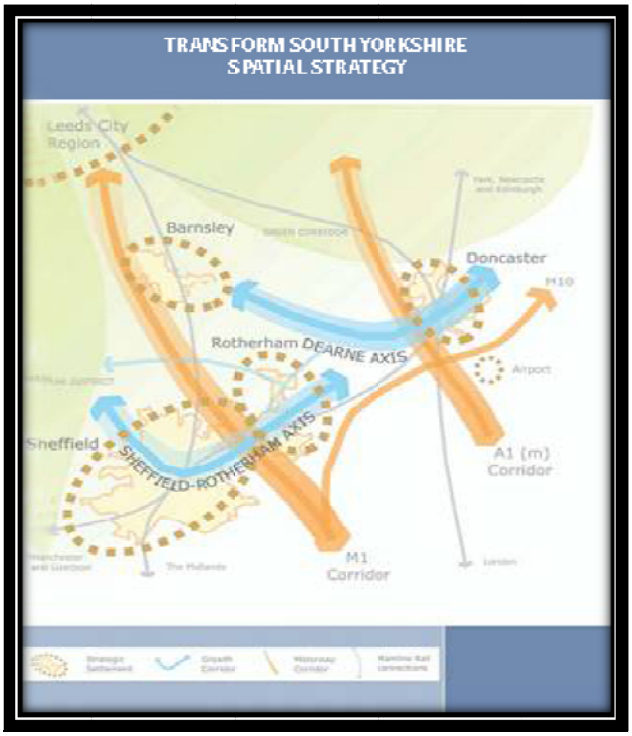
Manvers (Rotherham) Mine in U.K.;
"The four district of Barnsley, Doncaster, Rotherham and Sheffield constitute the metropolitan county of South Yorkshire" [18]. Currently, South Yorkshire seeks to reinvent itself following the decline of its own traditional industries, to become recognized as a heart of regeneration projects [19].

Regeneration projects tend to focus on physical aspect, usually housing, and protecting the legacy of the industrial culture in the city [20]. The closure of coal and steel industries were accelerated due to the new energy policies in the world between the 1980s and 1990s[8]. For communities, the closure of coal mining areas causes severe distress because of the threat of economic and social collapse (LIMPITLAW, 2004).

[8] For more information look at http://en.wikipedia.org/wiki/History_of_coal_mining

As can be seen from the figure (Figure-2.2), the project of urban regeneration areas can be described on the spatial strategic development in South Yourkshire. Rotherham is one of the important places for the heart of the implementation in the regeneration projects. The Manvers Regeneration Area is located in the Dearne Valley among Rotherham, Barnsley and Doncaster [21].

Figure -2.2: Planning of Spatial Strategy for South Yorkshire



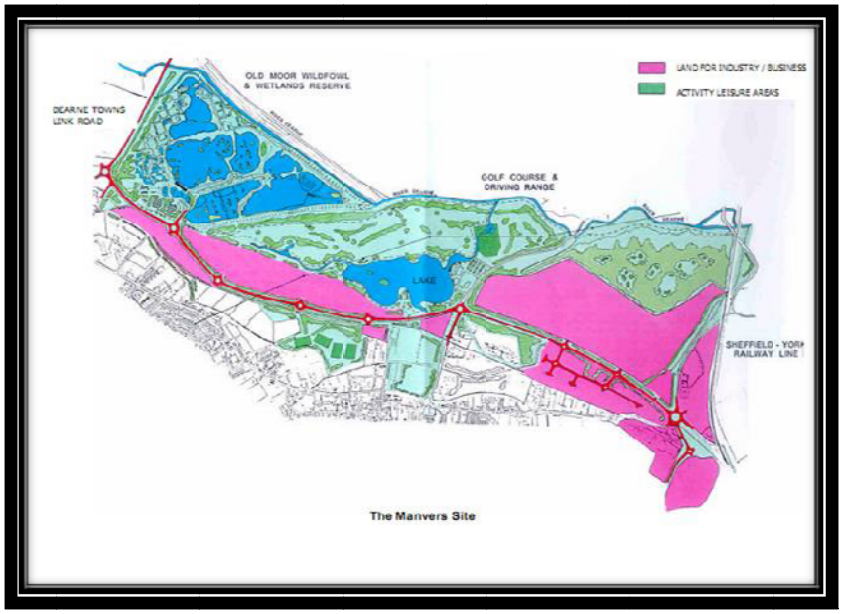
Source: [22]

Wath Manvers was an agricultural community until the 1800's when the development of the canal (1797) and railways (1840) brought new industry to the area [21]. Depending on this development, population was also expanded from 662 in 1801 to 2623 in 1871 and it reached 12000 in 1911 [21]. Manvers economy was based on the coal mining industry until the 1980s and it started to experience a rapid decline in the coal industry afterwards [21]. Currently, the following statements represent the necessity of regeneration projects in Manvers [21];

- *"An increase in derelict land from 411 in 1982 to 1300 in 1992*
- *A loss of around 8000 colliery jobs between 1981 and 1993*
- *An increase in unemployment from 13.9% in 1980 to 23.7% 1988"*

The Wath Manver city council approved the “Master Plan” for the abandoned areas because of the coal mining closure program [21]. The master plan provided 400 acres of land for industrial development, which contained a mixture of small sites and business parks [21]. The northern third of the regeneration area provided active leisure uses which included a 40 acre lake, an 18 hole golf course and driving range, a wetland nature reserve, a community park and large passive recreational areas [21]. The regeneration projects included high quality landscape and environmental restoration in the new development of the area.

Figure -2.3: The Manvers Regeneration Site



Source: [21]

Table-2.5: Analysis table for Manvers Regeneration Project

Analysis Table	Urban Regeneration Project
Organization Model	Public Sector, Local Authority, Private Sector
Economic Values	The Master Plan provided 400 acres of land for industrial development, which included a mixture of small sites, business parks and what was, at the time, intended to be a 158 acre site for a major single inward investor (part of the Plant Site).

Environmental Values	The northern third of the regeneration area is within the Green Belt and the plan provided for active leisure uses in this area including a 40 acre lake, an 18 hole golf course and driving range, a wetland nature reserve, a community park, large passive recreational areas and large areas of high quality landscaping to create a high quality environment to attract the new development.
Social Values	Balanced and integrated communities are needed to provide socially cohesive and healthy neighbourhoods. Providing a mix of tenures for a range of households in a neighbourhood supported by the necessary infrastructure
Creator of Project	Council of Wath Town

Source: [21] and [22]

These projects have many approaches to guiding change that can help to regenerate planned, structured and explicit abandoned sites. A particular onus placed on physical planning is its ability to create a better quality and efficient physical environment in the cities that will be the foundation for higher quality of life and better place to live in [23]. This is supported by economic prosperity, environmental stability and social vibrancy in implemented regeneration projects [23]. Urban regeneration projects play a leading role in shaping the sustainability content and a new approach to abandoned sites development [24]. The regaining of abandoned sites is the central approach in terms of the implementation of regeneration projects.

Oranje-Nassau Mine in Netherland;

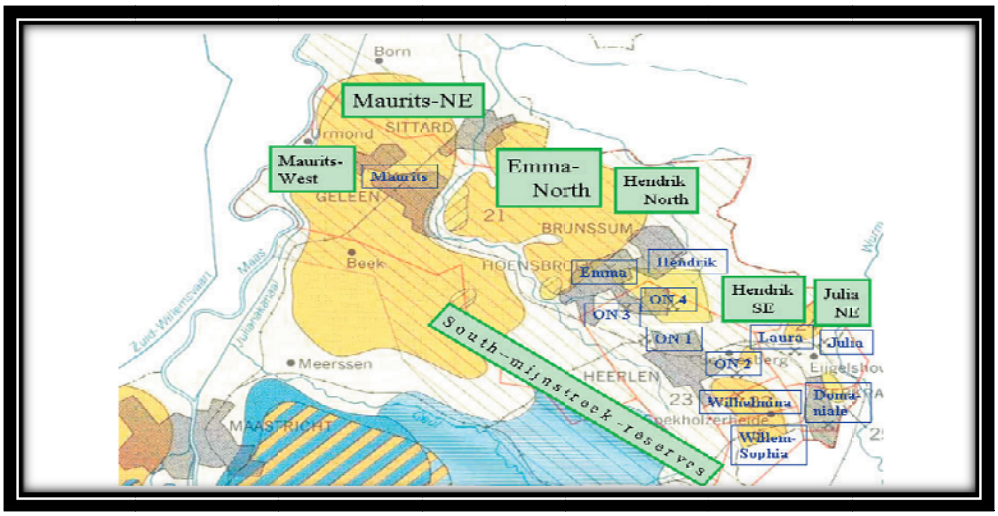
Until 1967, Dutch coal production was between 12 and 14 million tons (Mt) per year (GEOLOGIE EN MIJNBOUW 1971; JONG, 2004). In the second half of the twentieth century, the energy market changed direction from coal mining to oil, natural gas and nuclear power (JONG, 2004). In 1975, when all Dutch mines were closed, the market of coal mining almost disappeared especially due to the large-scale utilization of natural gas (JONG, 2004). The oil crisis of 1978 had an effect on the closure program in the Netherlands and thus the Ministry of Economic Affairs arranged to re-start mining operation (WEEHUIZEN 1974: JONG, 2004). In 1978, however, it was

concluded that long term prospects were definitely closed with the state mine Emma (MESSING, 1998; JONG, 2004).

From time to time, oil crisis came up to the market development which affected the closure of coal mining activities or restarted the coal production. In the early 1980s, The Ministry of Economic Affairs ordered the Dutch Geological Survey to start an exploration campaign to study the remaining Dutch coal reserves (VAN LEEUWEN, 1987; JONG, 2004). Dutch Geological Survey prepared an advice to the ministry of economic affairs to suspend further exploration (JONG, 2004). The current situation in the energy market needs a short-term renewal of inland coal production (JONG, 2004). However, economic conditions are not stable due to the emerging new technologies in the market (JONG, 2004).

In the second half of the twentieth century, there was a shift in the direction of the energy market from coal mining to oil, natural gas and nuclear power (JONG, 2004). In 1975, the Netherlands closed down all its coal mining areas (JONG, 2004). One of them, Oranje-Nassau, was closed in 1971 [25]. This area suffered a lot, as is the case for other coal mining areas which were regenerated from coal mining to housing and public use areas.

Figure -2.4: Location of the former mines (transparent boxes) and remaining reserves (closed boxes) in South Limburg (Mijnstreek). [ON: Oranje Nassau mines.]

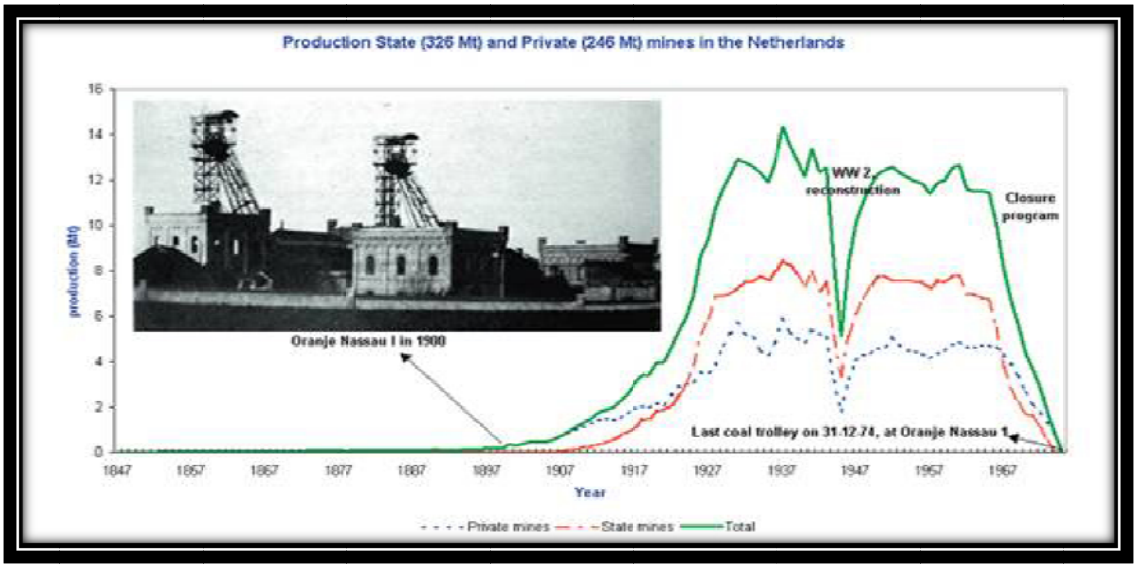


Source: JONG, 2004

Kerkrade had started to produce coal since medieval times (JONG, 2004). The

opening of the Oranje Nassau mine in 1899 in Heerlen displayed a systematical industrial development of the coal reserves (ENGELEN, 1989; JONG, 2004). Different statements for the Netherlands coal mining development commenced far away from the political and economic centre (JONG, 2004). The Dutch Government stared to get involved in only later preventing too much foreign influence on the coal production (MESSING, 1988; JONG, 2004). Between 1925 and 1967, the production of Dutch coal mines were between 12 and 14 Mt yearly (Figure-2.5)

Figure -2.5: Yearly Dutch Coal Production between 1847 and 1975



Source: JONG, 2004

In 1965, the Dutch government decided to close all its mines due to high costs and negative effects on the environment (JONG, 2004). The mines were closed within a 10-year program (JONG, 2004). Consequently, all the mining facilities were shut down and closed, which caused the regeneration implementation as part of new development in the area. The redevelopment program was aimed at regaining this area as an urban open space or encouraging the new economic development. Some small monuments were used as a reminiscent of the former coal mining industry in the area. Currently, there are no further development activities for future coal exploitation in the Netherlands. All former coal mining areas are closed and filled in South Limburg (JONG, 2004).

Table-2.6: Analysis Table for Oranje Nassau Regeneration Project

Analysis Table	Urban Regeneration Project
Organization Model	Central Authority
Economic Values	All coal mines were shut down and were transformed to other industries for the re-life of areas.
Environmental Values	The region underwent an unprecedented redevelopment program (“from black to green”) and new industries replaced the former mining industry.
Social Values	A fair safety distance to the old workings areas should be maintained in order to protection of society and keeping them into this area for the healthy life.
Creator of Project	Central Authority, Private Sector

Source: [25]

The problem of coal mining is common all over the world. Many coal mining areas are affected by vacancy and abandonment problems, which, in turn, results in many other problems in urban development. The Brownfield dilemma has been complicated by contamination problems. Vacancy sites and economic decline have been major concerns in all steps of the project implementation.

The Brownfield problem might lead to new development options in the city centre. In this case, the Netherlands created neighborhood and public use areas in its former coal mining sites that helped to regain and reuse these sites as integrated into the urban development. Additionally, Brownfield areas play a key role in satisfying public demands and in new development options. In this sample implementation in Brownfield sites, the project has been enough to mitigate and regenerate the former coal mining areas.

Figure -2.6: Overview of the Oranje Nassau from past to present

Source: [26]

Duisburg Nord Landscape Park and Zollverein Essen in Germany;

The Ruhr Area is a region in Germany in the state of Nordrhein-Westphalia to the North of Düsseldorf between the river Rhine in the West and the Sauerland in the East and between the river Ruhr and the Lippe (DIJK, 2002). The area has many different characteristics with 5 million inhabitants in the project area which has urbanized and suburbanized landscape (DIJK, 2002). The Ruhr Area consists of many smaller and larger towns and villages (DIJK, 2002). The region took an important role after early 1900s in Europe (DIJK, 2002). "*The vast urbanization of the region, which started in the middle of the nineteenth century, was overwhelmingly related to the industrialization of the region"* (DIJK, 2002). Although some coal mining for local and regional use existed, the growth of the mining industry started after 1838, when it became possible to cut the marl stratum (DIJK, 2002). The coal mining industry was supported by the iron industry and this situation established the other near industry in the Ruhr region (DIJK, 2002).

The process of industrialization of the region had continued until the 1960s (DIJK, 2002). Since 1870s, the Ruhr was already seen as quite important for German economic growth and political power (DIJK, 2002). New branches were developed at the end of the nineteenth century, but all these new industries were depending on coal, steel and machine building. "*Between 1871 and 1905 the population was increased from 723,000 to 2,6 million inhabitants"* (DIJK, 2002). Depending on industry development, the population movement increased in the area. But currently many younger people are leaving the area, because of the shutdown of the industries in the region (DIJK, 2002).

In this current development, population decreased in the Ruhr region, as is the case for the whole country (Table-2.7). The demographic structure was slowly changed from young generation to an old one. Also, a movement of migration started, which led to shrinking problem in the Ruhr region.

Table-2.7: Population Development in Selected German Cities between 1990 and 2004

CITY	POPULATION		CHANGE
	31.12.1990	31.12.2004	
BOCHUM	396.000	382.000	-3,5%
DORTMUND	598.000	585.000	-2%
DUISBURG	535.000	503.000	-6%
CHEMNITZ	296.000	246.000	-17%
HALLE	311.000	238.000	-23%
SCHWERIN	128.000	99.456	-22%

Source: FRIESECKE, 2007

The Ruhr was not only the industrial heart of Germany, but it is also the industrial heart for the whole of Europe for more than 100 years [27]. Ruhr Region was characterized by late industrialization, but it was pursued recklessly and on a grand

scale [28]. The crisis on the heavy industries was come up with outstanding dimensions to the Emscher Region. Widespread Brownfield and urban decay provided an opportunity for regenerating structure and environment.

According to Dijk (2002) general problems in the area were determined with following statements;

- *"The development of new growth zones in non-industrial areas and the removal of economic activities.*
- *Ecological problems and bad housing situations.*
- *One-sidedness of economic activities and strong impact of traditional core industries of early industrialization; a failure in diversification of economic activities and dependency on large industries".*

This dramatic development resulted in many abandoned houses and abandoned areas in the Ruhr region. International (Emscher Park) Building Exhibition (IBA) was established for the problem solution as a ten years program to redevelop economic, social, ecological perspectives on the area [29]. IBA has achieved many successful projects in the area in this period. IBA has a private sector status which is supported by governmental structures for the revitalized Emscher Region [28]. IBA projects might be listed in terms of general approaches as follows (ZLONICKY, 1999):

- *"Industrial monuments convey a message of culture; they are signs in a landscape devoid of orientation marks, marks of regional identity in an area which so far had difficulties to win its inhabitants' and visitors' affection.*
- *Differentiated forms for dwelling are to be provided, including the maintenance of the existing stock, especially the old workers' cottages with garden-city features, and innovations with new building forms on Brownfield sites".*

Figure -2.7: IBA action area in the context of the Ruhr region

Source: ZLONICKY, 1999

Duisburg Nord Landscape Park

"Germany`s Ruhr area, particularly Emscher District, was one of Europe`s largest coal mining and steel-manufacturing centers" (LATZ+PARTNERS, 2005). The areas boomed with coal, steel and other related industries, which have been in great decline in recent years. After the shut-down of all these industries, people started to migrate to other areas, which caused economic decline and contaminated environment. The IBA agency achieved many projects mainly in the built sites in the Ruhr Region. Duisburg Landscape Park is one of these successful projects in the Region. Duisburg Landscape Park area is one of the former sites of coal mine and a smelter. After the closure of all industries and coal mining areas, the area was designed as Landscape Park which is a useful recreational and public area within industrial heritage background. It covers about 200 hectares, mainly Brownfield [27]. The heart of the park is a disused Thyssen Steelworks-unique historic setting, and now a place of industrial heritage and at the same time a venue for different leisure-activities [27].

Zollverein Essen

The area is defined as an industrial archeology and industry identity. It is established on an area of 55 hectares (KUNZMANN, 2006). It was designed in 1932 by Fritz Schupp and Martin Kremmer and it was closed in 1986 (KUNZMANN, 2006). In

2001, this site was chosen as a World Heritage Site as a representative example of the development of heavy industry in Europe (KUNZMANN, 2006). Today Rem Koolhaas prepared a master plan on an area of 1 million m^2 in Zollverein (KUNZMANN, 2006). The area includes a visitor center, design center NRW, The Zollverein School of Management and Design, Casino Restaurant, a public park etc... (KUNZMANN, 2006).

The urban transformation process is currently faced with the problem of abandoned industrial areas. Many developed countries started to suffer from this problem due to new economic dimensions. Germany is one of these countries and the heart of industrial areas of Germany was renovated and brought to the new urban development. The IBA offered to restore the old industrial region and to remove the disadvantage in the Ruhr region [27]. From this perspective, Zollverein is one of the important implementations that successfully shows industrial heritage of meaning (Figure-2.8).

Figure -2.8: View of Zollverein Coal Mining Industry Complex

Source: [30]

The level of success of Brownfield projects have been realized by IBA in the Ruhr Region. These Brownfield projects are shown as a key in development and have created sustainable way of solutions with economic, ecological and social aspects. Obviously, all these projects revealed that the level of analysis into the situation in

abandoned areas is not sufficient. Hopefully, this study will help to close this gap through an analysis from the top of planning decision and bottom of the design implementation.

The projects have not been able to analyze the state of abandoned areas in a way sufficient enough to understand the problem in a detailed way. This can be observed in German projects, as is the case for the projects of the UK and the Netherlands. Zollverein is one of the projects that provided a new dimension of thinking over the postindustrial development. Design is covered by regaining the abandoned areas, but still urban necessities are not analyzed adequately in this project. This study will develop a precise solution for and analyze all aspects of the abandoned problem through a new technique.

Figure -2.9: Over view of Duisburg Nord Landscape Park

Source: ANONYMOUS, 2003

Figure -2.10: Panoramic view for Duisburg Nord Landscape Park

Source: [31], (Christoph Moseler`s images)

Table-2.8: Analysis Table for Duisburg Nord Landscape Park and Zollverein Coal Mining Industry Complex Regeneration Project

Analysis Table	Urban Regeneration Project
Organization Model	Public Sector, Local Authority, Private Sector
Economic Values	Cultural heritage has become a key factor in improving people surroundings, and encouraging economic development (LOURES, 2009).
Environmental Values	From the beginning, principles of ecology and sustainability guided design and implementation of this new landscape (LATZ+PARTNERS, 2005). Remnants and demnolished structures were reused in planting substrates, recycled concentrete, or new paving materials (LATZ+PARTNERS, 2005).
Social Values	About two million people live in the region, and in the late 1980s the unemployment rate exceed 15% (LABELLA, 2001). The ecological degradation was mirrored by phschological resignation among much of the population (LABELLA, 2001).
Creator of Project	IBA (International Building Exhibition)

Source: LABELLA, 2001 and LATZ+PARTNERS, 2005 and LOURES, 2009

All these projects displayed general guidelines for other regeneration projects;

- Renovate, renew or reuse some existing buildings depending on the project implementation,
- If buildings have some historical importance or special background, they should be maintained as a museum or landmark.

- Preserve existing vegetation and support this vegetation within new design approaches,
- Provide a variety of leisure activities and areas for cultural activities
- Clean and reconstruct the whole area within regeneration approach,
- Provide public participation in the process of the implementation regeneration project,
- Provide economic revitalization in the area development,
- Provide integration with existing surroundings.

These projects should ensure coordination between appropriate development and sustainable planning process in order to have appropriate planning development. According to Pediaditi (2006), Brownfield redevelopment puts forward some opportunities as described below;

- *"Brownfield redevelopment is believed to offer the opportunity to revitalize communities while simultaneously permitting the use of existing infrastructure and easier integration of the project into the wider urban context (DETR, 1998)*
- *Brownfield redevelopment offers the opportunity to create a more spatially integrated, mixed urban environment composed of resource efficient and high quality buildings.*
- *Brownfield redevelopment is also promoted on the assumption of its ability to reduce pressure to develop Greenfield sites (GRIMSKI et al, 1998)".*

The evaluation of the urban process requires an approach to appropriate planning in order to be able to solve the problems concerned. In this case, urban abandonment is one of the most important problems which could be integrated with the surrounding development within social, ecological and economic approaches. All these approaches need to be adaptable to the areas and their features. This particular development could establish general principles for future projects and be helpful for prospective researchers.

2.4. Principles of Urban Regeneration Implementation

Regeneration strategies are often criticized for structural socio-economic problems of

places (RACO, 2003). Their impact has a broad range which affects areas of political, economic, ecological and social features. All these parameters affect the places and place development for the regeneration approach from past to present. In this sense, the prestige of abandoned areas should be maintained through historical background and social integration. All the places need a creation of economic background that will help them to adapt themselves to and survive in the land use development. Political parameters also affect decision makers about development direction on the land. Ecological, economic and social background also describes place identity and value.

All these principles are assessed in the regeneration projects of Brownfield redevelopment. These fundamental features are summarized as follows;

- Sustainable approaches cover the whole social community from top to bottom in Brownfield redevelopment,
- Sustainable development for the community requires balance between communities expected and areas needed,
- Brownfield redevelopment provides society with economic gains needed for the areas sustainability,
- Brownfield redevelopment maintains the balance between ecological value and usage of community,
- Brownfield redevelopment should emphasize the identity of areas,
- Regeneration projects provide variety and alternatives for the redevelopment concept,
- Political decisions should also help to develop abandoned and regain the urban areas development.

All these principles must be combined together and serve as a guide to the regeneration projects implementation. Major urban regeneration projects are justified by the public interest in recovering obsolete architectural heritage (COUCH et al, 2002; ORUETA, 2006). They are also needed in order to represent a new economic attraction for the area development. Ecological support could provide more public attraction and value to the area development in the urban regeneration projects.

According to Ayataç (2003), regeneration may use the following principles for success in sustainability of the regaining areas through the urban development;

1-Economic Principles

- Economic potential of the city should be utilized.
- There should be a defined budget for public investments.
- Recognising construction as an economic driver in its own right in stimulating local economies [22].
- Maintenance of high and stable levels of economic growth and employment [22].
- There should be a competition among architects and developers and it should be encouraged.

2-Social Principles

- Social structure and pattern should be well known.
- People should be made conscious of the conservation of urban spaces.
- Social progress which recognizes the needs for everyone [22].
- Local People supportive.
- A feeling of ownership and belonging should be developed.

3-Regulatory and Administrative Principles

- Should have a defined and regular managerial, legal and financial environment.
- Should have a system sustainable independent from parties and politics.
- Should be able to produce innovative and contemporary regulations.

4-Planning Principles

- Broad-participation partnership: an appropriate partnership should be developed with different local authorities, government and other participants in the design and application of urban regeneration programmes.
- General and local strategies: local development strategies should be redefined according to any national structure,; there should be main principles.
- Policies on local and national level: policies on a local and national level should be understandable.

- Application methods: New methods should be searched for transitions in urban life and new evaluations.

5-Design Principles

- Urban Design Pattern: there should be a strong urban pattern even apparently at the level architectural elements; conservation should be a simple design guide.
- Design guide: there should be a simple design guide.
- Secure Spaces: Defensible spaces should be included,. Areas hosting crime and vandalism, if any, should be determined.
- Aesthetics and Comfort: public contribution should be a precondition for a better appearance and comfort.
- Urban Landscape: landscape should be an important component in design pattern.
- Urban Design principles and applications are physical mediator's regeneration. Therefore; it creates an urban image
- Facilities access to inhabitable urban spaces, supports effective use of urban land and urban development
- Creates accessible and secure spaces
- Restores spaces of collapse to the city
- Creates secure public spaces and streets accessible in human scale
- Creates visually quality and attractive spaces
- Changes urban behaviours, contributes to the cultural environment, develops quality in urban life
- Plays a role in the change of position and role of cities within the country and its region
- Encourages mixed use
- Ensures continuity between old and new urban pattern, establishes an integrity
- Encourages creativity
- Ensures economic liveliness
- Encourages investment to urban spaces

Old industrial districts and areas are still geographically important in the cities located

at easy access, near to sources, provided well design infrastructure etc. In this sense, Brownfield abandoned areas need an integration of new cities development planning. In this particular integration, regeneration principles will be a guide to the healthy and planning development.

2.5. Potential Development on the Derelict Areas within Urban Regeneration Projects

Derelict areas refer to totally empty urban spaces and no use of any facilities and death of the usage places. For example, many buildings erected during the construction boom of the 1920s have been destroyed and turned into empty buildings in Detroit (COLLINS, 2003). The areas will soon have no cinemas, no bookshop, no jobs etc., which will give opportunities for new development and ideas for regenerating the areas.

Ergenekon (2003) explains positive aspects of urban regeneration and how it can act as an agent for public interests:

- Preferences of society: precedence and preferences for making policies and decisions should be given to the society.
- Relationship with planning: Urban regeneration projects should be evaluated within city plan and city program.
- General needs of the site:
  - A land use should be prepared for the general needs of the site
  - The marketing opportunities
  - The sheltering opportunities of the landowners in the project area
  - The project boundaries must be arranged in a way that will include the most dilapidated areas. Thus, the neighbourhood areas can be developed and improved.

Places are increasingly being encouraged to develop local solutions to local problems (AMIN and THRIFT, 1995; TUROK 1999; RACO, 2003) which is need to understand the identity and history of the areas, so that politics and local strategies of abandoned areas are enhanced for the redevelopment of the areas. Derelict areas

also provide opportunities for local identities and strategies in a new development approaches.

Abandoned areas have the potential for raising environmental standards and the quality of development and bringing life to the areas within new project implementations. Accessibility is the main issue for the use of areas, which is another potential option for abandoned areas development. In this case, urban abandoned areas could be displayed as a new face of development for the urban development. Generally, abandoned areas provide some potential options in the urban regeneration and development. The options are presented below;

- Abandoned areas protect urban green areas, which provides an opportunity for development and new urbanization,
- Abandoned areas provide a new economic dimension for the cities,
- Provide higher public awareness and satisfy public demands in a better way,
- Symbol of the cultural heritage for future generations,
- Provide “landmarks” for the new regeneration projects, which is important for tourism and new economic attractions,
- Provide intervention between local authorities and public,
- Provide open space in the limited urban space which is majorly occupied by settlements.

Characterizations of the success or failure of places play a central role in shaping patterns of future rounds of investment and disinvestment (MASSEY, 1996; HUDSON, 2000; RACO, 2003). For this reason, land potentials have important role in redevelopment and provide opportunities for the future. In this sense, urban abandoned areas bring a number of potentials for future development.

2.6. Structural Change of the Derelict Areas

Globalization is the most effective economic part of the spatial development. This new phenomenon currently changes planning approaches and structural development in cities. In the globalization process, industrial areas started to decline and then turned into derelict areas. Derelict areas are those areas that are

transformed from former industrial areas to new structural uses such as heritage buildings (as landmarks), museums or totally removed with respect to planning and design processes.

Former industrial areas reveal that the urban planning process has been dominated by global economic development and that regeneration of abandoned industrial areas is an advantage. Growth and investment are seen as sources of strength in an increasingly fierce climate of competition between places for hierarchical status and prestige (RACO, 2003). The identity of areas plays a key role in reflecting and reproducing particular forms of structural changes. Rebuilding places in this globalization process determines the reconstruction of imagination of new places. There is a dialectical relationship between the new globalization process and urban forms, which is giving a new shape also for the abandoned areas.

In an effort to promote new economic directions and social movements, urban regeneration projects are used to reshape the structure of abandoned areas. Creation of new forms and meaning for abandoned areas depends on the current economic competitiveness reshaped by the urban structures.

2.7. Conclusion

As a consequence, places put greater emphasis on selling themselves as centers of success (RACO, 2003). Urban regeneration projects need more sustainable approaches and particular attention to the areas of history. Places with negative images may find it increasingly difficult to attract needed investments (KEARNS and PADDISON, 2000; RACO, 2003). In this situation, derelict areas are needed to extract their value within cultural, natural, architectural and economic backgrounds which are more important for successfully regenerating these areas.

The abandoned areas have highlighted the significance of creating new approaches and ideas within urban regeneration projects. In these particular development approaches, place features have been a critical element in new urban regeneration strategies. Particular visions are required for abandoned areas in order to remove the bad image from the urban environment. With this particular attention, urban

abandoned areas should not be ignored, habitable areas should be created through sustainable urban planning approaches to solution and new approaches should be prioritized.

All projects from Germany, the U.K. and the Netherlands pointed out sustainability within an economic, ecological and social context. The projects might emphasize some general approaches, but they are still unable to satisfy the expectation of cities in an exact manner. The background of projects is generally considered as regaining economic benefit through the design of abandoned areas. Solutions for abandoned areas need specifically to define the expectations of cities development, and to bring other requirements as well as economic benefits.

This study will determine a new approach through quantitative and qualitative analyses to the abandoned areas. This technique enables one to conduct a detailed analysis from general problem definition to design decisions on the abandoned areas. This study may bring the precise design content on the abandoned areas. In addition, the study could help to solve the shrinking problem through new development methods for cities.

Urban regeneration approaches makes an attempt to find solutions for overall problems of the abandoned, slum and negative face of the city. The concept of urban regeneration can therefore go through the way of design implementation on the project area. Especially these conditions lay the foundation for other urban regeneration projects. Consequently, the operation of urban regeneration can be determined with economic, ecological and social objectives. These objectives were extracted from former implementations of urban regeneration, which will integrate social, physical and economic outcomes for a new urban regeneration implementation in city development.

3-DEFINITION OF URBAN REGENERATION AREAS IN TURKEY AND URBAN STRUCTURAL EFFECTS

The urbanization process in Turkish cities is inevitably going to lead to the expansion of land use and population growth. Even so, But population growth significantly decreased from 2.5% (1980-1985) to 2.2% (1985-1990) (IŞIK and GÜVENÇ, 1999). Additionally, according to the census taken in November 1997, the Turkish population grew at an annual average of 1, 5% during 1990-1997 period (IŞIK and GÜVENÇ, 1999). This development shows a radical transformation in urban areas under the economic, social and political restructuring process starting from 1980s (DURSUN and EKMEKÇİ, 2010). Many cities in industrialized world and in Turkey are now facing a declining population and often in associated with the loss of job and overall economic decline (MULDER, 2010).

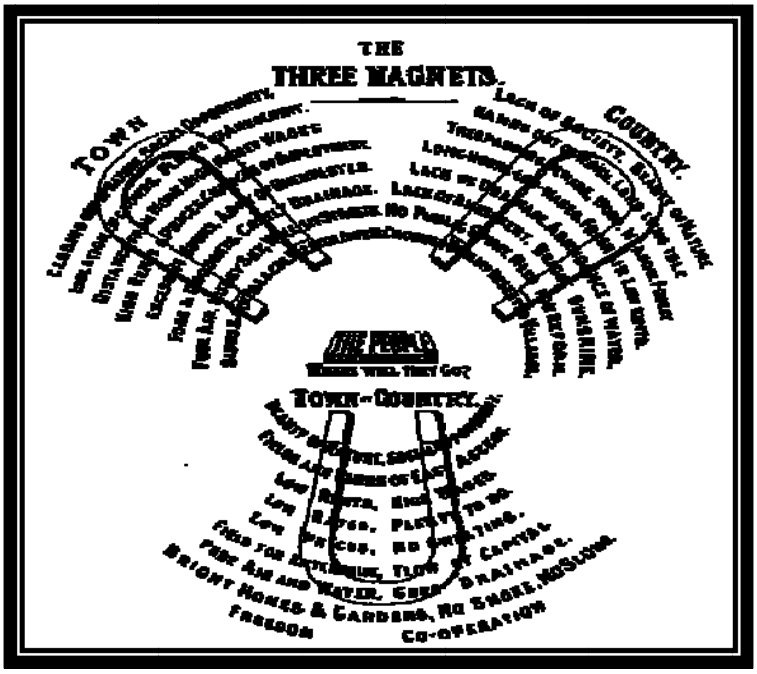
Migration is one of the main urbanization processes that deeply influence the development of Turkish cities. A typical problem concerning migration in urban areas is the unplanned development issue, whereas for abandoned areas is the deterioration of the urban environment (TAKEUCHI and HANAKI, 2005). In Turkey, migration from rural areas to the cities began with severe effects on the cities in the 1950s (ERDÖNMEZ and ÖZDEN, 2009). Currently, some Turkish cities attract many people and show sprawl problem in the city development. On the contrary, some Turkish cities cope with shrinking problem and suffer from the tangible consequences of this development. Shrinking cities lose significant portion of their residents over time, which is typical of industrial and mining cities (LINDSEY, 2007). This chapter discusses the Turkish urbanization process related to economic, political, social and cultural developments from past to present. The analysis of Turkish urbanization process can also help to define the tendencies of current urbanization development in Turkey.

3.1. The Dynamics of the Urbanization in TURKEY

The urbanization process of Turkish cities has brought about some crucial points on the basis of social, political and economic development. Migration between rural and urban areas is generally undertaken as a result of many economic and social problems. An important approach to rural-urban population movement is Ebenezer

Howard`s three magnet theory (Figure-3.1). This idea exerted a major impact on 20th urban planning (SVENDSEN, 2009). Howard`s original three magnet theory could obviously be applied to Turkish cities development. According to Howard (1898), "*the town offered economic social opportunity, but degraded environment. The country, after years of agricultural depression, in contrast offered an unpolluted environment but few jobs, pour social opportunities and overall poverty. But the third magnet, town-country, could offer all the advantages of town and country without concomitant disadvantages"* (HALL, 2000). Nevertheless, unlike Howard`s approach, Turkish cities failed to maintain the balance between town and country population movement. Present conditions in urban development in Turkish cities attract country population thanks to many services such as accessibility to the educational areas and hospitals. These services always attract people and result in migration to Turkish cities.

Figure-3.1: The Three Magnets



Source: [32]

Hall and Ward (1998) revised the Howard's theory in terms of new development in cities. They believed that Howard's diagram still encapsulates contrast, but polarities are reversed (HALL and WARD, 1998). The deindustrialization process has taken over city development in recent years. This process is the decline of manufacturing and industrializing as a source of employment and its replacement by jobs in services and information-handling occupation (NOYELLE and STANBACK, 1984; GERTLER,

1985). This process also causes the decentralization of economic activity to the fringes of metropolitan areas and to previously peripheral regions or countries (LONSDALE and SEYER, 1979; SAWERS and TABB, 1984; GERTLER, 1985). Unlike Howard`s prescription, recent progress of decentralization shows significant population movement periphery or fringe of town in many cities.

Since the beginning of the 21st century, the term “shrinking city” has been used widely in developed countries (WOLFF, 2010). It is used in the context of demographic change, economic decline or even suburbanization (ANDERSEN, 2005; WOLFF, 2010). The urbanization process in Turkey started to affect the deindustrialization process in the last decade. Increasing globalization and post-industrial development has forced a new development in Turkish cities. Consequently, Turkish city development has encountered many challenges from past to present. Economic, political and social-cultural dimensions are useful points in order to understand the urbanization process in Turkey.

Economic Dimension

When the Turkish Republic was established in 1923, the country had been devastated by economic conditions (ÖZCAN, 2006). In Turkey, the level of economic development started with governmental support all over the country. Economic policies that appeared in Turkey in these years all tried to regain economic conditions in the country. Government could foster the development of private entrepreneurs by helping the rates of return from private investment through direct government subsidies in these years (ADELMAN, 1999). This economic development led to urban services in Turkish cities.

In these years, the government took a number of factors into consideration while selecting the site for industrial areas and proved to be the driving force behind the economic development for Turkish cities. This progress has transformed the places from rural small towns into developing cities, such as Karabük. The effects of the Marshall Plan[9] on the Turkish economy appeared in 1952. The mechanization of

[9] To see for more information: http://en.wikipedia.org/wiki/Marshall_Plan

Turkish agriculture was a result of the implementation of the Marshall Plan (ÖZBUDUN and ULUSAN, 1980). The U.S. Marshall Aid provided core industrial development in cities. The Marshall Aid and its impact had mainly on accelerating people migration from rural areas to the cities in Turkey. Mechanization reduced the need for manual labor in the farmland (BARNESTON, 2009). This development was a result of the accelerated urban migration in Turkey. This rapid pace of urbanization was posing major challenges as well as opportunities in Turkish cities (SANJAYKUMAR, 2008). One of the major challenges was Urban Sprawl, which was an inevitable outcome of Turkish urbanization process resulting in various problems in the cities at this time (SANJAYKUMAR, 2008). Turkish urbanization process leaded to the growth of cities related to industrial and economic development in these periods (TURAN and BESIRLI, 2008).

Industrialization of Turkish cities stimulated labor demand and created opportunities for employment and the other types of income generation (FUKUNISHI, MURAYAMA and YAMAGATA, 2006). Industrialization and fast urbanization process triggered labor migrations in the cities. In practice, this urban economic policy was the reason for fast urbanization development for some Turkish cities such as Ankara and Istanbul. The development of Ankara has led to a rapid increase in the services sector more than industrial sector. In particular, globalization is often seen as a key to new urbanization process all over the world. A shrinking problem has developed based on a particular conception of this global economic change (THORNLEY, 1999). This development is the reason for the new problems in Turkish cities.

Political Dimension

In the early years of the Turkish Republic, development of the rural areas was supported by governmental policy. Held between 1923 and 1938, the Izmir Economic Congress[10] can be seen as the first initiative to determine the Republic's economic policy and political decisions (AKTAN, 1991). The Izmir Economic Congress had deep consequences on both rural areas and urban areas with spatial political decisions. These decisions pointed out the following important issues;

[10] To see for more information: http://en.wikipedia.org/wiki/%C4%B0zmir_Economic_Congress

- The republican government controlled financial resources and gave political decisions for the city at macro and micro levels of spatial implementation (ÖNGE, 2007)
- The Izmir Economic Congress emphasized mining, electricity power, machinery and equipment, and building cement and sugar factories in some provinces (AKTAN, 1991).
- To handle the industrial fields whose raw materials were inland and easily obtainable (INAN, 1972; TAKIM and YILMAZ, 2010)
- To ensure the need and consumption of the produced goods were directly proportional, while specifying the production capacity of the factories which were thought to be established (INAN, 1972; TAKIM and YILMAZ, 2010).

The economic and political changes are both the causes and effects of the rural-urban migration (COLES, 2001). Rural population movement was not significantly increased in urban areas until 1950 in Turkey. The period of 1950s in Turkey was mainly shaped by the shift to multiparty democracy from single party (ÖZTÜRK and ÇIRACI, 2010). This development triggered large migration from rural areas to urban areas. Besides, these political decisions could have led to a loss of balance between rural and urban population movement. Turkish cities underwent intensive of population growth during these periods.

This radical political decision was the reason for the acceleration of the urbanization process in Turkey. Increasing levels of urbanization were induced by natural growth of the urban population and migration of the rural population towards cities [33]. This sudden increase in population also caused several problems in cities like traffic congestion, housing, sanitation and health (PORIO, 2009).

In alignment with this development, the population of rural areas has had great tendency to settle in metropolitan areas. This pressure brought about the enlargement of urban areas even more and revealed a lack of enough housing in the cities (Figure-3.2). Squatter settlements were the main solution for the housing problem and it was the reason of unplanned development in the cities.

Figure-3.2: Squatter House (Gecekondu) Development in Turkish Cities

Source: [34] and [35]

Generally, squatter settlements occupied vacant properties in the cities. The crucial factor accelerating and encouraging the squatter settlement was the appearance of “amnesty law” that transformed illegal settlement to legal settlements (ERGENOĞLU et al., 2005). In 1948, the laws number 5218 and 5228 were enacted (DOĞAN, 2009), the squatter settlements particularly started to be legalized by these amnesty laws. The degree of the physical expansion of the squatter settlements of the cities has outpaced the capacity of the city government’s infrastructure and the basic urban services (MELESSE, 2005). Squatter settlements caused significant unplanned development and rapid expansion in the cities.

The local authorities failed to stop urban sprawl and they could not manage to find a feasible solution for squatter settlement (ZIGMANN, 2007). Therefore, squatter settlements have easily expanded in the Turkish cities in this period. The volatility of squatter votes can be traced back to the early days of multiparty elections in Turkey (ÖZLER, 2000). The issue of squatter settlements has historically been courted by political parties, which used patronage to mobilize votes from the very beginning of competitive elections (ÖZLER, 2000). These political approaches have played a key role in these spatial structures development in Turkish cities.

Social and Cultural Dimension

Turkish economic and political strategies were shaped by a combination of internal

and external pressures and influences in the post Second World War years (ÖZCAN, 2000). These economic and political processes brought out social and cultural alteration in Turkish cities. Definite alteration on cultural and social life was started with joining NATO and with exterior sources of the Marshall Aid in Turkish cities. These developments allowed more accessibility to the urban areas. In particular, the mechanization of agriculture was the main reason of the migration from rural areas to urban areas in these periods.

These developments have illustrated social and cultural changes leading to substantial alterations of the built environment (SCHALCHER, 2009). The increasing rate of urbanization in the 1950s led to a great lack of housing and soon to uncontrolled development in the squatter settlements in Turkish cities (YÖNEY and SALMAN, 2010). Low-income citizens moved into the least desirable housing units in collapsed, abandoned old city centers and squatter settlements areas in the cities (DURSUN and EKMEKÇİ, 2010).

People started gradually migrating from village to the cities in the middle of 1940s and this migration caused unsystematic urbanization and fast development after 1950s in the cities. This development produced squatter settlements as the dominant housing in metropolitan cities. According to Keleş (2002), families of squatter house (gecekondu) established continuously squatter settlement culture in this changeable process. At the same time, this culture became dominant and common culture in the metropolitan areas (KELEŞ, 2002).

According to Kıray (1998), other factors in the change brought about the emergence of the middle class. Therefore, the development of new great capital established a new mid-upper class in Turkish cities. In this way, representative classical cities group for modern urbanization lost their relative superiority to new developing of root of wealthy and rural groups**.**

The 1950s brought about rural migration and reasons for decreasing new wealthy groups changed urban life which gained new dynamics for itself (KIRAY, 1998). Especially, cities started to talk about dual structure (urban nobility-rural root). With the beginning of the 1980s, this dual structure was seen with different housing life

styles (TEKELİ, 1982).

Although these dual structures continued in metropolitan cities, the urban cultural structure and social layer became the determination level with creation of divided urban value and transfer. Recently, migration wave from rural areas to urban areas almost stopped and this migration created characteristics of regional center cities such as Diyarbakır, Erzurum, Antalya, and Mersin in Turkey.

3.2. Effects of the Urban Life Style

The dynamics of industrial economy produce cycles of business expansion, stagnation and decay in the globalization context [4]. This development is marked by dramatic decline in both the social and physical infrastructure of inner city (CARTER and POLEVYCHOK, 2003). *The EPA (U.S. Environmental Protection Agency) defines Brownfield as "Abandoned idled or underused industrial and commercial facilities where expansion or development is complicated by real or perceived environmental contamination"* (FIELDS, 1995; [4]). This definition shows that abandoned or underutilized properties are an obstacle to redevelopment in cities (HETTIARACHCHI et al., 2010) and affect urban areas negatively.

The globalization process on industrial development affects all types of industrial development in both heavy industrial areas and manufacture areas in Turkish cities. The global industry can introduce a new set of dynamic forces into cities. The process of urbanization and changes rely on an ability to adapt new development trends in the world. The adaptation of new development brings a new problem and new dimension of perspective into cities. Turkish cities have many serious problems from past to present in these new trends of development. Currently, one of the important problems is called shrinking cities or shrinking problem. A shrinking city is mainly caused by severe population and job loss in a place [36].

In this process, it is quite difficult to claim that the regional approach and planning development in Turkey follow a uniform and consistent path (POLAT et al., 2011). Today, the growth of cities is characterized by conditions very different from the one in the past. Cities, especially metropolitan areas, are reluctant or find it difficult to cope with the shrinkage increase in the urban development (LI and PIACHAUD,

2006). In the process of global competition, some cities not only outperform their rivals, but also outperform them for a considerably long period of time in Turkey (BARCA, COŞKUN and ALTUNIŞIK, 2002). This gives to the cities an advantage in the globalization process in competition with other cities. The majority of competitive cities enjoy distinctive advantages. For instance, they can adapt themselves to new economic development in an easier way and take part in global development.

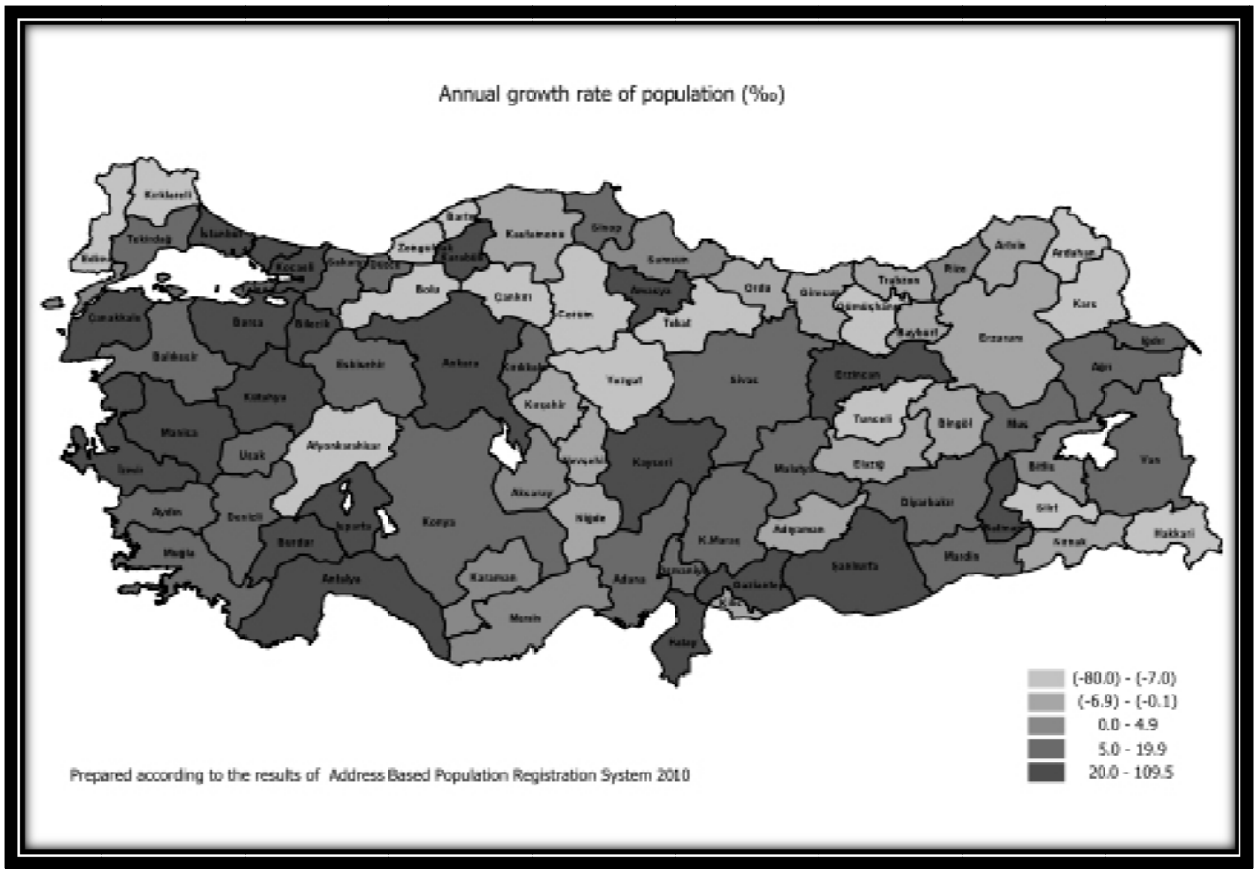
In many cases, such as the cities in the Black Sea Region, the economic decline of these industrial sites is felt by their city and their region as whole (BROOKINGS, 2007; SHETTY, 2009). A consequence of the shrinkage is the challenge of renovating an infrastructure that covers a larger population (SHETTY, 2009). The shrinking problem is crucial in terms of effects on the social and economic life in cities.

General characteristics of shrinking cities are defined as follows;

- One of the important characteristic feature of Brownfield sites is their negative impact on the neighborhood (TRUSINS, 2005),
- Cities lose massive population and ageing causes housing vacancies in this problem (SCHWARZ and HAASE, 2010),
- Cities are experiencing a dramatic decline in their economic and social base [37],
- Shrinking cities are exposed to a combination of high level environmental pollution problems [38].

All these issues greatly influence the development of cities. Also these problems trigger many other problems in city development. These issues affect the quality of life today and will do so in the near future. There is strong evidence that cities are required to overcome the shrinking problem and its destructive influences.

Figure-3.3: Annual Growth Rate of Population in 2010 by Provinces (%)



Source: [39], (Turkstat, Turkey`s Statistical Yearbook, 2010)

This map (Figure-3.3) provides some important clues with regard to the demographic changes that took place in 2010 in Turkey. The massive population decline appeared in 12 cities in Turkey during the years between 1985 and 1990 (IŞIK and GÜVENÇ, 1999). Between 1990 and 1997, this number increased from 12 to 26 cities in Turkey (IŞIK and GÜVENÇ, 1999). Currently, regions of Black Sea and Eastern Anatolia are still losing their population to the other regions.

The cities of Zonguldak, Kastamonu, Karabük, Bartın, Sinop, Bayburt, Kars, Ardahan and Artvin constitute areas of depression while they are losing population to the metropolitan areas or to the surrounding cities. The industry sector loses its significance in the globalization process (GÖKŞIN and MÜDERRİSOĞLU, 2005). The cities in Turkey gradually encounter deindustrialization problems along with many other problems. In order to achieve sustainable development for Turkish cities, it is necessary to prevent the problem of shrinkage.

3.3. Effects of the Urban Management System (Cooperation between local management and public)

The globalization process taking place in the context of information society provides a broad range of opportunities (STRATIGEA and GIAOUTZI, 2000) and problems in cities. This economic development has been introduced to address economic restructuring, neighborhood decline and population loss in Turkish cities (SIEGEL and WAXMAN, 2001). Globalization and industrial re-structuring lead to marginalization, impoverishment and social exclusion for large number of people in the cities (CASTLES, 1999). Because of this development, the solution for deindustrialization must focus on cooperation between local authority and people. This restructuring process brings very important changes to the functional, institutional, and fiscal structure of local governments in Turkish cities (PARLAK et al., 2008).

"The more determined revival of interest in public participation in planning today owes a lot to general trends in society and to concerns of government" (ODPM, 2004; TOWNSEND and TULLY, 2004). With the development of regeneration schemes, city governments undertake this revival of interest in new urban development strategies through the provision of cultural facilities (e.g. concert halls, museums, art galleries etc.) in their cities (SEO, 2002). By using cultural strategies, city governments, particularly older industrial cities, tend to emphasize the positive elements of cities (SEO, 2002).

The public life of the cities forms part of new cultural policy understood as a result of the complex interplay between citizens and key actors of urban governance in the globalization context (HRISTOVA, 2010). The cooperation between local governments and people provides support for the regeneration of the city image in this process. The local governments struggle with many problems in Turkey. The change in population brings about problems in a large part of city activities as well as in production capacity (OHNO, 2009). This influences people's daily life and it is the reason for economic decay in cities. Turkish cities must adapt themselves to this new development and satisfy expectations of people associated with the necessary social and economic context.

In this process, many Turkish cities must be in a struggle to take place in global economic development. Local governments have a key role in providing coordination between expectations of people and new development options in this global process. The globalization must reconsider the role of public participation in and the potential contribution to sustainable development in Turkish cities. Traditional approaches to management and development in cities are required to adapt themselves to new global expectations in the cities.

Modern public administration urge cities to innovate, adopt market orientation, and improve transparency and services in a style suited to the 21st century (GADOT and MEUIRI, 2008). This approach creates sustainable development together with social structure, culture and economy. Local governments must carry out a large number of complex tasks, covering important parts of the welfare system and public services in cities [40]. Both public participation and local government take an important role in sustainable development for cities.

In the context of globalization, cities are frequently intended as a sort of collateral effect, since it is assumed that the transformation due to globalization implies the co-existence of winners and losers (SCOPPETTA, 2011). This drastic development of cities must take public demands and necessities into consideration for solution approaches in Turkey.

3.4. Effects of the Urban Structures and Urban Development

Urban structure provides principles for managing development to ensure both the area`s urban and natural character are considered in the globalization process for planning development [41]. The role of the globalization process has wide effects on cities and regions in economic development. The kinds of industrial policy needed in the international setting are clearly different from traditional forms of industrialization strategies (LALL, 2004). Currently, the most successful cities pursue and implement coherent and adaptable economic development strategies [42]. The deindustrialization impact of the core on the urban structure has a conflict with sustainable city development.

Local government should ensure sustainable development, and coordination with community and demands of people in Brownfield sites. Balanced community can only evolve, if the cities have the schools, health facilities, leisure facilities that together offer a good quality of community life [43]. Local governments in Turkey lack a single dominant management system that can create a significant solution approach with public participation.

In order to transform spatial conditions of abandoned areas, alternative policies are implemented through either economic or social schemes (MÜHÜRDAROĞLU, 2005). The globalization process increase regional disparities between winning and losing regions in Turkey (GESANO et al., 2009). Both urban structure and urban development expose radical transformation during the globalization process. The effects of this process should be considered as a new planning strategy associated with social, economic and ecological approach in Turkish planning system.

3.5. Attempts of the Development Guidelines for Urban-Regional Planning Practice

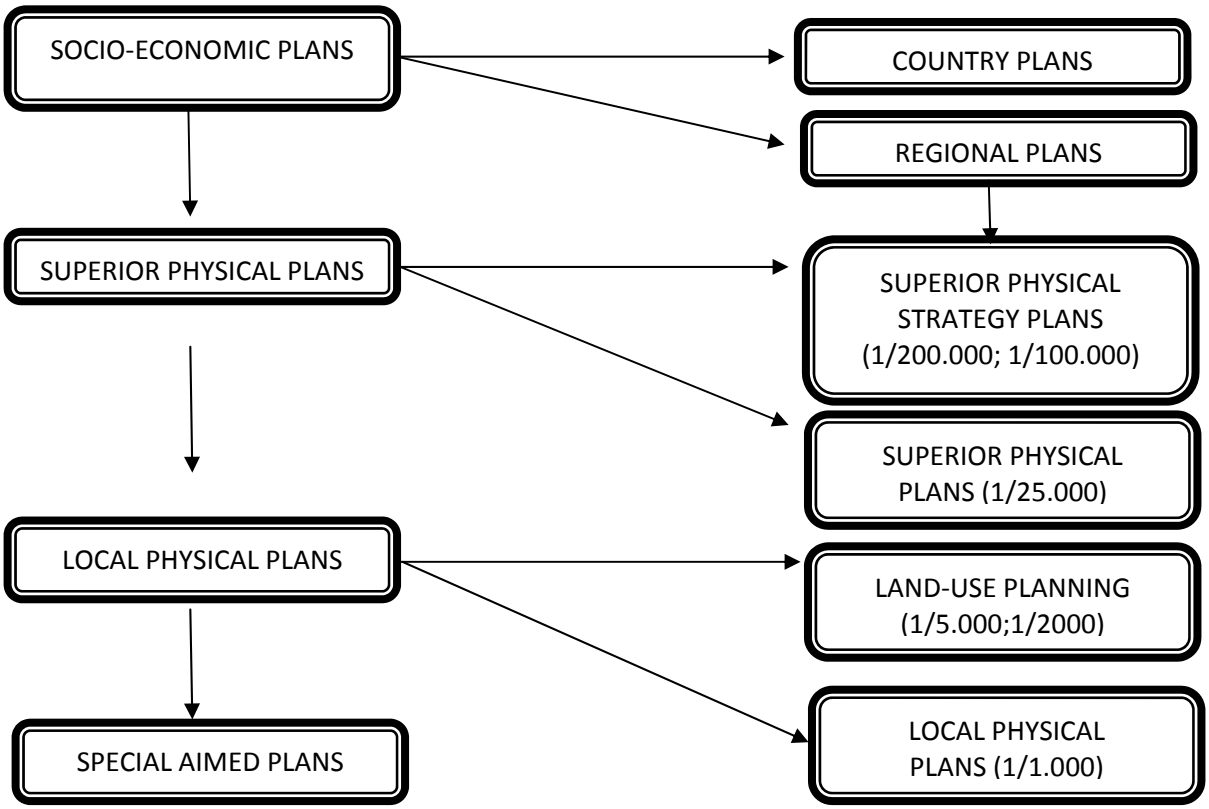
Population movement not only plays a key role in the growth of urban centers, but also it strongly influences the social, economic and demographic structure in cities (HUGO, 2003). Currently, deindustrialization process affects social and economic conditions in cities and regions. Deindustrialization process is the reason for the closure of industrial capacity in cities. Therefore, the suitability of previously developed industrial sites in urban areas should be assessed in accordance with globalization process strategies [44]. Spatial planning and management system need new laws, regulations and guidelines for this current globalization process in Turkey.

The planning system in Turkey has a complex structure (TÜRK, 2002). This structure has been shaped with various planning laws from the past to present (TÜRK, 2002). These laws are the basic implementations of the urban planning development. In 1930, Municipalities Law was arranged by the government (TÜRK, 2002). The law empowered all municipalities to prepare local physical plans (TÜRK, 2002). The basic purpose of the local physical plan is to plan and develop the settlement areas in a way that will satisfy their needs [45]. But still a local physical plan must be

approved by the Minister of Public Works in order for it to be implemented. This suggests that central administration has a clear control over local physical plans in Turkey.

Plans are divided into two main sections in Turkey (TÜRK, 2002). The first one is socio-economic plans and the second one is physical plans (TÜRK, 2002). Physical plans are also divided into sections depending on their size, namely physical plans (1/200.000, 1/100.000,1/50.000 and 1/25.000 scale), land-use plans (zoning plans) (1/5000 and 1/2000 scale), local physical plans (1/1000 scale) (TÜRK, 2002).Socio-economic plans include country plans and regional plans. The Turkish planning systems represented by this figure is shown below (Figure-3.4);

Figure-3.4: Turkish Planning Systems and Hierarchy of Plans



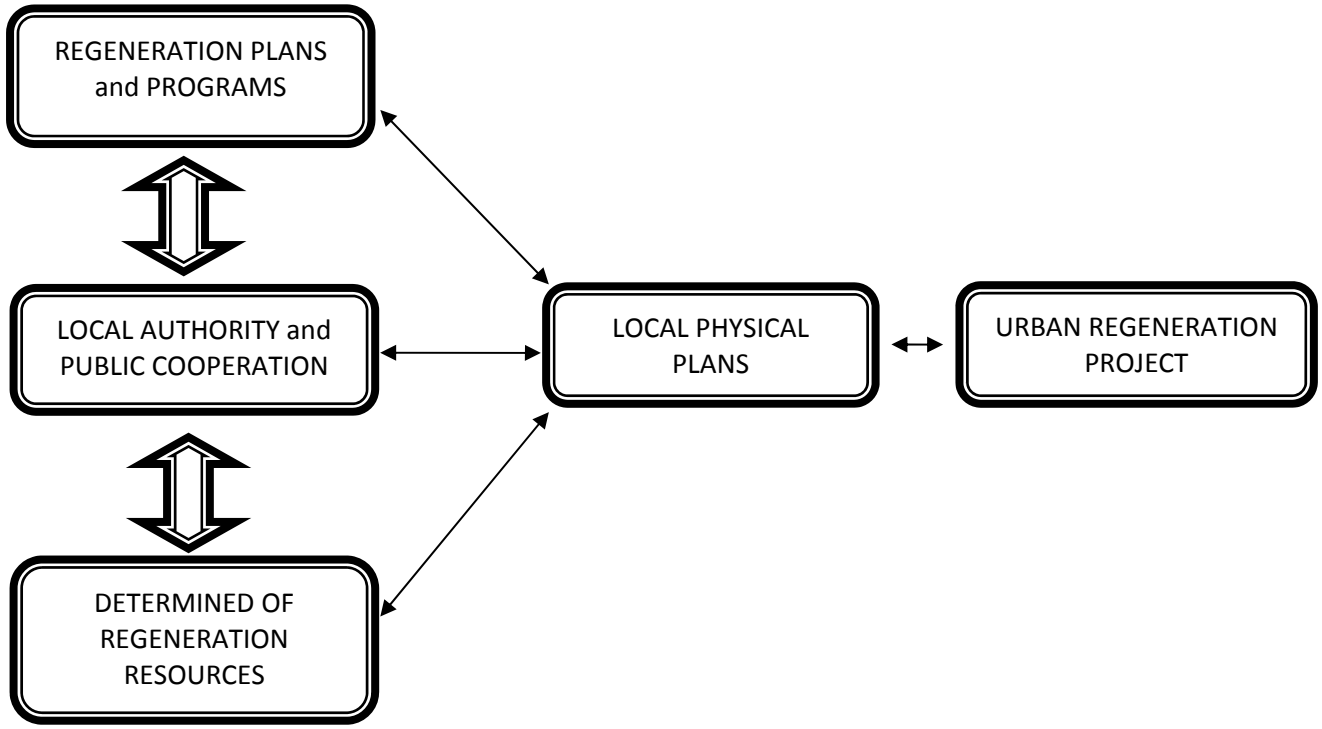
Source: TÜRK, 2002

Local physical plans in urban areas constitute the healthy urban structure, to provide land development and to regulate the use of private and public land for public interest in Turkey (TÜRK, 2002). A local physical plan is the main tool of the spatial planning implementation in Turkish planning system. An attempt should be made to adapt

urban regeneration projects to the local physical plan level in Turkish planning scheme.

In the traditional planning approach, local physical plan can carry out all regeneration projects from problem identification to plan implementation in cities. Regeneration project in local physical plan can be gradually arranged in order to solve shrinking problem in Turkish planning scheme. It is clear from figure (Figure-3.5) below that local physical plan is the crucial tool of regaining abandoned sites in Turkey.

Figure-3.5: Regeneration Implementation Guidliness for Turkish Cities



Sources: Mustafa Ergen, 2009, (Author`s own construct)

Local physical plans [land use planning (1/5000; 1/2000) and local physical planning (1/1000)] must include the aspect of shrinking problem to find out an appropriate solution. Nowadays, regional and urban shrinkage can be observed (FINA, 2008) in many Turkish cities. Cities need to participate in global process through both new laws and guidelines in Turkey.

Local governments are responsible for creating more job opportunities, public participation, improved economic conditions, and environmental restoration in

abandoned areas. Urban regeneration projects create great opportunities in abandoned areas that have precious alternative paths to development in cities (DANIELSON, 2002). Participation of people in regeneration projects is important to understand their expectations in city development. Local physical plan requires an arrangement between local government and public participation in terms of regeneration project implementation. Finally, it is obvious that Turkish planning system should be revised for shrinking problem in the globalization process.

3.6. Conclusion

Turkish cities have been faced with many urbanization problems from past to present. In recent decades, the effects of deindustrialization have produced largely distressed urban areas (CONWAY and KONVITZ, 2000; CAMARDA et al., 2010). The spatial planning system in the past is not sufficient to find an obvious solution for the shrinking problem in Turkey. Successful local management, as is nowadays considered within a context of sustainable development, is highly connected with the emergence and implementation of new forms of management systems (GETIMIS and COLLOVINI, 2000). Therefore, the local government must be willing to understand shrinking problem associated with sustainable strategies and approaches in cities.

The globalization process affected the economic and political approaches with the transition from industrial development to post industrial development in cities. The reason why migration takes place is that people need new social environments, new economic opportunities and want to adjust themselves to new ways of life style. People started leaving their cities depending on economic conditions, as is the case for Zonguldak, and moved into other cities. Abandoned areas in urban environment can be considered as part of the territorial capital in cities, and this heritage should be socially and economically reintegrated through strategies of reuse (RODA, 2005). Currently, the potential removal of abandoned structures is particularly the main approach to Turkish cities.

At this point, the analysis of Turkish cities suffers from problems considering the spatial pattern of the deindustrialization process in Turkey. The factors in the

deindustrialization process have negative effects on socio-cultural and economic development. In some Turkish cities, economic development has failed to change significantly the extensive type of development and to ensure a successful transition to sustainable development [46]. It should be noted that urban planning and management must focus on the benefits of the shrinking problem and carefully analyze advantages and disadvantages of the solution approaches on the abandoned areas.

Turkish cities are confronted with immensely complex ecological, political, economic and social problems in the globalization process (HOOVER, 2011). In order to utilize the potential of the cities there is a need for an integral approach in which cities are regarded as arenas where various planning challenges can be tackled in a context (SCHYLBERG, 2011). Finally, it is important to emphasize that Turkish planning system must be rearranged not only for the current problems but also for future problems.

4- URBAN REGENERATION AREAS and THEIR CONSTRUCTION-INTEGRATION INTO CITY; A CASE STUDY OF ZONGULDAK

This chapter offers the best chance to create a completely new methodological approach within existing Brownfield redevelopment implementations (MAIDE and JAKAB, 2007). The method employed in this study describes an appropriate solution for Brownfield redevelopment in cities. To regain Brownfield areas, such quantitative and qualitative methods as SWOT analysis and Grid method with Hierarchical Cluster analysis are applied as a main solution in the study. This method provides a profound effect on urban regeneration approaches to city development.

It is not common, also, though not unheard of, to use qualitative and quantitative methods, where these methods construct a model of what must be, then test that model on the abandoned sites (WOODS, 2006). In this study, the specific approach attaches importance to potential integration of methods into the ecological, economic, social and characteristics of abandoned sites. This chapter provides information on the methodological approach of the study to come up with an appropriate solution for Turkish cities.

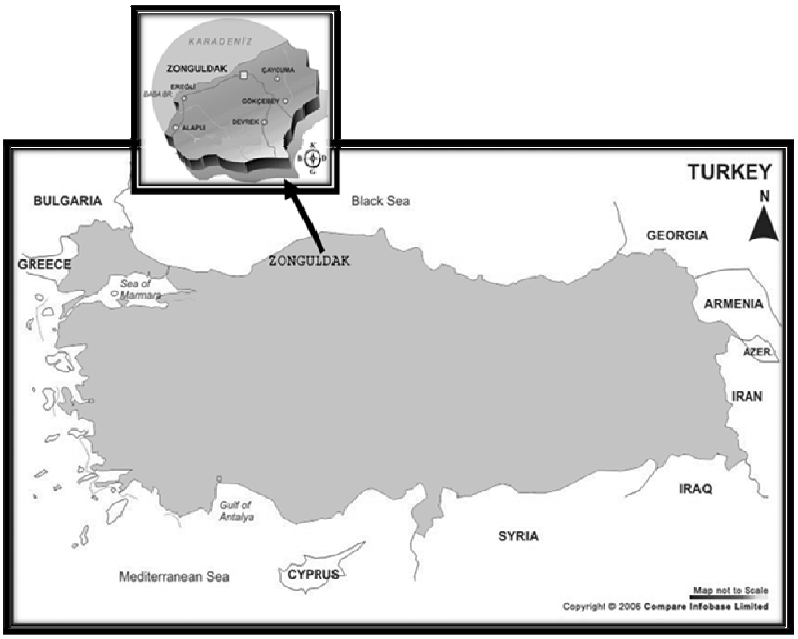
4.1. Structure (Current) Situation and Development of Zonguldak

Located in the Western Black Sea region of Turkey, Zonguldak has an area of 8625 km^2 and covers 1.1% of Turkey's total land area (Figure-4.1) (ANONYMOUS, 2006). Zonguldak generally consists of inclined terrain due to its natural topography. Mountains in the Western Black Sea run parallel to the coast in Zonguldak and they rise sharply from the sea, elevations rising till 1976 meters (ANONYMOUS, 2006). This high mountain system provides a block between the sea and the Central Anatolian Plateaus (ANONYMOUS, 2006).

The Western Black Sea region, especially Zonguldak, is a centre of coal mining and heavy industry [47]. *"Turkey's main hard coal deposits are located in the Zonguldak basin, between Ereğli and Amasra on the Black Sea coast in north-western Turkey"* [48]. Most of this ore is utilized by iron, steel industry and power plant in the region.

Zonguldak is the leading hard coal supplier in Turkey. "*The state-owned Turkish Hard Coal Enterprises-Türkiye Taşkömürü Kurumu (TTK) has a de facto monopoly on the production, processing and distribution of hard coal, although there are no legal restrictions on private sector involvement"* [48].

Figure-4.1: Location of Zonguldak City in Turkey



Source: [49] and [50], (The Figure is prepared by Mustafa ERGEN, 2009)

The crucial development of the Zonguldak region shows that hard coal brought substantial and definite change in primary economic structure in 1829 when it was found in the basin (T.C. İMAR VE İSKAN BAKANLIĞI, TURKISH REPUBLIC MINISTRY OF RECONSTRUCTION AND SETTLEMENT, 1964; IŞIN, 2009). The discovery of coal in Zonguldak led to a boom of population in the region. Zonguldak, which used to be a village, was transformed to a city on account of rapid economical development.

Coal started to be produced under the management of foreign firms in 1848 in the basin (GÜNDOĞAN, 2005; IŞIN, 2009). It should also be noted that the management of coal mines was started by the French firms in the basin (IŞIN, 2009). The development of the Zonguldak basin brought many coal mining workers to the coal mines in this period. Fisherman houses were transformed into settlement areas due to the increase in the number of coal miners in Zonguldak. Squatters, unauthorized houses and unhealthy planning development take the lead in city

development (AKIŞ, 2009).

In 1899, the Zonguldak coal harbor (Figure-4.2) was built for the hub of coal transportation in the city (ANONYMOUS, 2006). New washers (coal), new employee houses and power plants have steadily increased industrial productivity in Zonguldak. Therefore, Zonguldak have suffered from the effects of rapid urbanization and created new economical dimensions in the region.

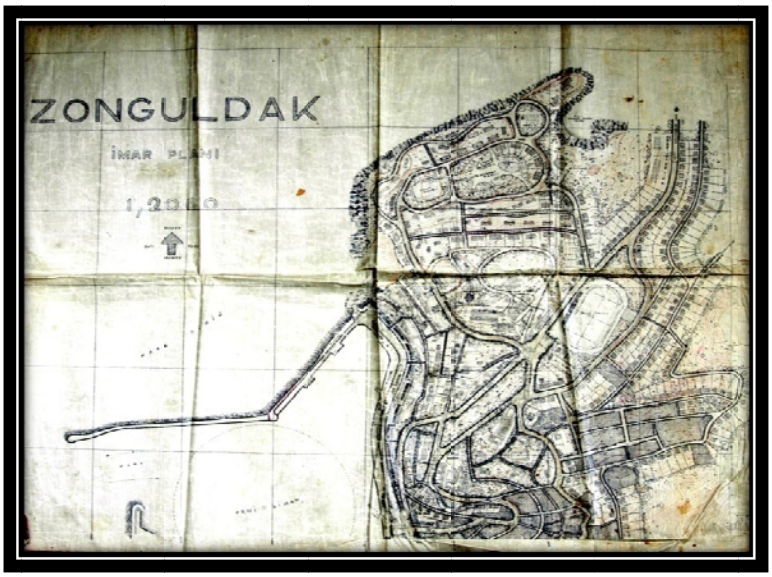
Figure-4.2: Zonguldak Port Comparison between Past and Present

Source: [51] and Mustafa Ergen, 2007, (Author`s own image)

The form and structure of Zonguldak is shaped by coal mining development. The people of Zonguldak' rural areas supplied the underground workforce of the coalmines (GÜRBOĞA, 2005). The city started to grow up around the coal mining areas so that workers settled in the coal regions [52]. The first plan was regulations governing the development of coalmining areas, which was arranged in 1921 (Havza-I Amele Fahammiye mining law number 151) (ANONYMOUS, 2006). The principal objective of this act was to mitigate this unhealthy and fast urbanization in the basin. Zonguldak was announced as a province due to rapid urbanization and accelerated development in early Turkish Republic.

The first settlements were formed around the port of Zonguldak, and Üzülmez, Kozlu, Asma mines in the city (ANONYMOUS, 2006). The problem of settlement areas in the city has grown in parallel with the increasing coal mining development (Figure-4.3). This development has had far-reaching effects on planning development.

Figure-4.3: Development Planning Map



Source: ANONYMOUS, 2006

The iron and steel industries have been the fastest growing economical development in the region, in 1939 and 1960 in Karabük and Ereğli respectively (ANONYMOUS, 2006). This major industrial development has been able to support economic connection between coal and iron steel industry in the region. Between 1965 and 1980, the population of Zonguldak doubled through the spreading of urbanization across the region (ŞENGÜL et al., SPHERE-EUROPEAN RESEARCH PROJECT, 2011). However, this rapid increase in population stopped in the mid-1980s (ŞENGÜL et al, SPHERE-EUROPEAN RESEARCH PROJECT, 2011).

Zonguldak' local economy has relied on coal mining and coal industry from past to present. City development can primarily address coal production in Zonguldak. It is the reason that coal miners' houses remain all the time a second priority in city development. Zonguldak' urbanization process, when combined with other urbanization factors, creates a typical coal mining city development (Figure-4.4). The rapid development of coal industry in Zonguldak causes supportive industry to get developed in the region.

Figure-4.4: The View of Washing Coal Areas and Port in Zonguldak

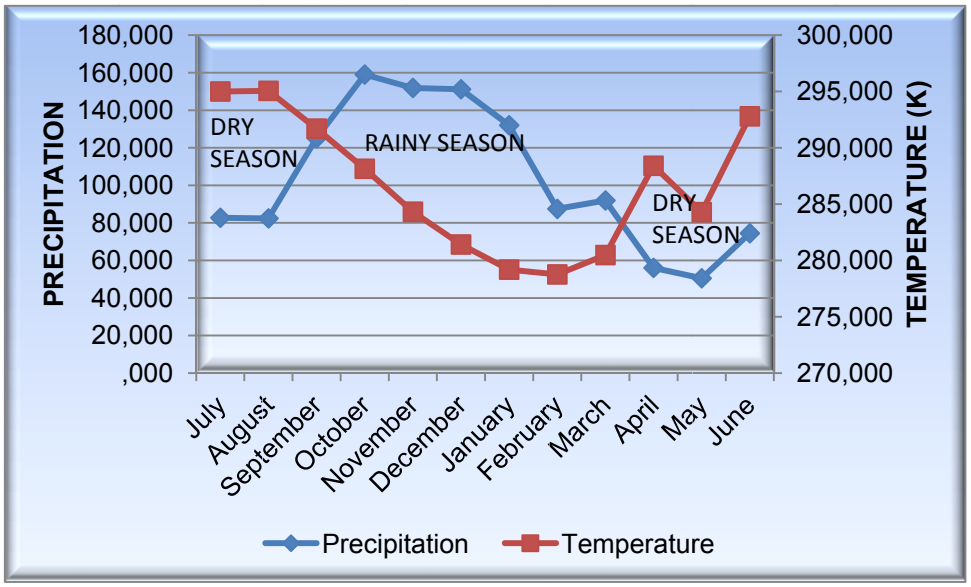
Source: [53] and [54]

As Zonguldak city is located between the sea and mountains, its topographical properties put obstacles in the way of is development in the city. This means that urbanization started to get developed on flat terrain in the basin. Since attempts have been made to construct all the structural development on the flat terrains of Zonguldak, urban development has been concentrated in certain areas. This led to a problematic and unhealthy development in the early stages of urbanization in Zonguldak.

Climatic Condition Analysis in Zonguldak

Zonguldak is a city that has many different plant species. This is based on the climatic value of the city. Zonguldak has a rainy spring and autumn, warm and humid summers and cold winters [55]. Precipitation and temperature are analyzed and an empirical attempt is made to understand the prevailing climatic conditions in Zonguldak. These are the basic elements of the ecological components of the city.

Figure-4.5: Oberothermic Diagram (Zonguldak Precipitation and Temprature Analysis for 2010)



Source: ANONYMOUS, 2011

The figure reveals that October and November are the rainiest months in Zonguldak. Furthermore, the diagram presents temperature evaluation in Zonguldak and shows that July and August are the hottest months in the city. In statistical terms, the mean precipitation and the mean temperature are is 103,13 and 13,62 respectively. Obviously, there is less sunlight available in the city; therefore, the leaves of plants may be bigger to keep using more sunlight for the plant evapotranspiration.

According to Emberger equation, we calculated to climate of Zongudlak with below definition Pulviothermic coefficient (Q) value:

Pluviothermic coefficient (Q)

$$Q_2 = \frac{P}{\left(\frac{M+m}{2}\right)(M-m)} \times 1000 = \frac{2000P}{M^2 - m^2}$$

Where P = Annual Precipitation.
M = Mean Maximum temperature of the warmest month.
m = Mean Minimum temperature of the coldest month.

Values of Q:
Q < 20 Saharan
20 < Q < 25 Arid

25 < Q < 50 Semi - arid
50 < Q < 90 Sub - humid
Q >100 Humid

An analysis is conducted into the prevailing climatic conditions for the last 30 years in Zonguldak. The total amount of precipitation in Zonguldak is 1244,71 mm. The maximum temperature is 4,98 degrees C° whereas the minimum temperature is 22, 54 degrees C°. The calculation shows that Q value is 247,16, which suggests that climatic conditions in Zonguldak can be classified as characteristics of humid climate. Planning development in the city is one of the important factors in understanding its conditions such as climatic analysis. The following section discusses planning development in Zonguldak from past to present in order to understand the current development in the city.

Planning Phases of Zonguldak City

The municipality of Zonguldak was founded in 1899 (ANONYMOUS, 2006). The first development plan (imar planı) for the city was prepared for coal mining areas in 1948 (ANONYMOUS, 2006). According to this plan, urban development regulations constituted the arrangement of healthy development in coal mining areas. It was so important that these regulations included definitions of necessary measurements and provisions for the impact of coal mining on the city.

In 1964, the Unit of Regional Planning, the Ministry of Public Works and Settlement, prepared a sub-regional planning for Zonguldak on the basis of the Development Law number 1587 (ANONYMOUS, 2006).

In the 1970s, the Bank of Provinces (İller Bankası) devised a new development plan for the Municipality of Zonguldak (ANONYMOUS, 2006). The Bank of Provinces incorporated the needs of not only Zonguldak, but also such districts as Kozlu, Kilimli and Catalagzi into this new development plan (ANONYMOUS, 2006). It should be noted that coal production dominated local economy in these places (IŞIN, 2009).

In 1971, these four municipalities got organized as the first example of metropolitan administration in Turkey (KELEŞ, 2002; GÜNDOĞAN, 2005). The area where the

planning was implemented was defined as ZMA, which stands for Zonguldak Metropolitan Areas (ANONYMOUS, 2006).

The spatial development plans for ZMA was devised after they were accepted by each municipality council in 1976 (ANONYMOUS, 2006). All these plans came into force and were approved by the Ministry of Public Works and Housing (ANONYMOUS, 2006). After this period, there was no development plan that covered all the problems in the city. Nevertheless, plan revisions and local arrangements were made for the solutions to the problems.

Although the Squatter Amnesty Law gave title deeds to those who had already settled on governmental areas, the local government did not succeed in providing updates on their development plan in the city. Therefore, the city suffered from the ownership problem in these areas. Development plans were completed by the Organization of Metropolitan Areas in the early 1980s (ANONYMOUS, 2006).

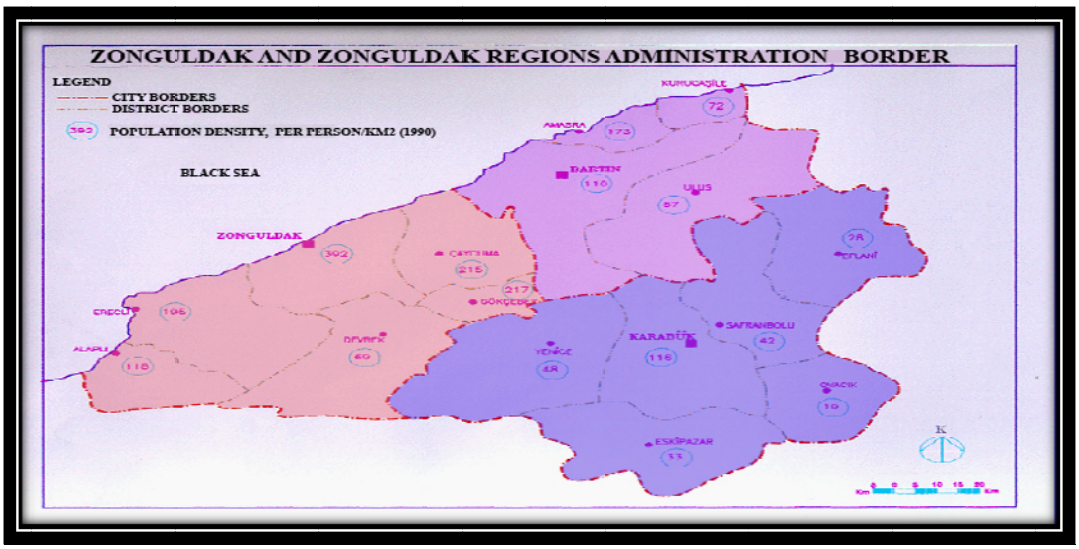
The amount of time allocated for preparing development plans was 20 years, and they were completed on time (ANONYMOUS, 2006). During the period, ZMA plans were put into practice but some of the changes became a serious problem for Zonguldak in the meantime. Likewise, the ZMA became an important industrial region of the country in that period (ANONYMOUS, 2006). Even so, the ZMA has lost importance and undergone a process of collapse over the past 25 years (ANONYMOUS, 2006), Hard coal production has significantly decreased due to the closure of coalfields in the basin. Owing to the closure of the coal mines, the overall decrease in coal output has had a negative effect on the economy in the short term for Zonguldak (ESSA TECHNOOLOGIES LTD., 2006).

In the late 1980s, the municipalities that participated in the planning phase changed their policy from the unity of municipalities (ANONYMOUS, 2006). Because of several reasons, the ZMA started to suffer from migration from the region to other areas.

In the 1990s, Bartın and Karabük were separated from Zonguldak and turned into cities (Figure-4.6). This development changed the administration border of Zonguldak

and had an effect on the economic situation of the region. In the 1990s, the Zonguldak-Karabük-Bartın Regional Development Project (ZBKP) was undertaken (ANONYMOUS, 2006). The State Planning Organization commissioned Joint Venture of BRL-TUMAS-GERSAR to deal with the project (GÜNDOĞAN, 2005). The ZBKP was completed in 1997 thanks to the public-private partnership for 10 years in the region (SANALAN, 1999; DOĞRU, 2004; GÜNDOĞAN, 2005). The ZBKP made an analysis of the consequences of the decreasing number of employment in TTK and the privatization of Karabük and Erdemir (DOĞRU, 2004).

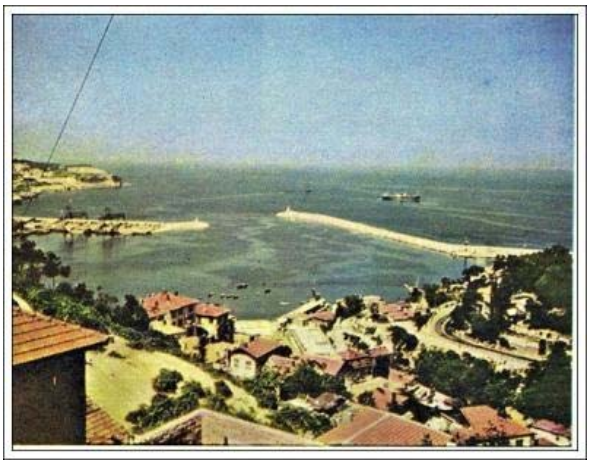
Figure-4.6: Zonguldak and Zonguldak Regions Administration Border

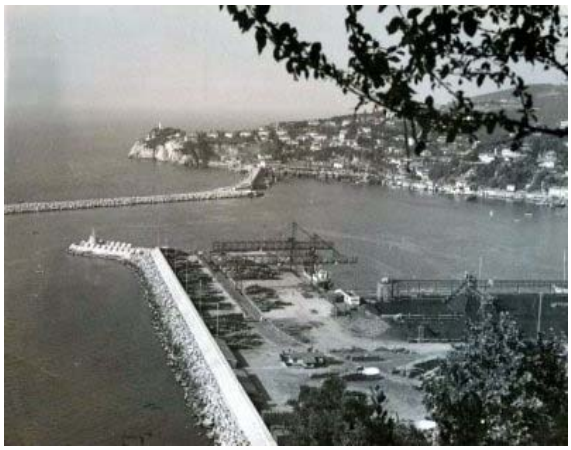


Source: [56]

With its iron-steel factory, Karabük is one of the most economically important places in the region. This city has a strong economic connection with Zonguldak because of this factory. The factory was privatized in 1995 whereas the privatization of the one in Ereğli is still underway (GÜNDOĞAN, 2005). Additionally, private sector decided to reduce using coal produced by Zonguldak. The decision marked a shift in the direction of this strong economic connection between Zonguldak and Karabük. The decision led to a decrease in the number of coal miners and the closure of coal mining structures in Zonguldak.

Figure-4.7: Overview of Zonguldak from Past to Present





Source: [51] and Mustafa Ergen, 2007, (Author`s own images)

4.2. The SWOT Analysis and Grid Based Modeling (Matrix)-Hierarchical Cluster Method for Zonguldak

This section focuses on research question one: “Which planning instrument and process can be used to develop a solution for Turkish cities?”. Through a case study of Zonguldak, this chapter makes an attempt to find an appropriate solution in the new methodological approach. Sustaining the city development requires an appropriate analysis and understanding of problem and, more generally, the dynamics of the interrelation among ecological development system, social development system and economic development system (BERKES, COLDING and FOLKE, 2003). Characteristics of abandoned areas support the direction of the framework in that it aims to focus appropriate approaches on the redevelopment of Brownfield sites (BEACHAM, 2008). The approach of the method used in this study has great potential to analyze an extensive field from micro scale to macro scale. The methodological approach to Brownfield problems have significantly shifted from the site specific perception to wider perspective strategies in the context of land management in the thesis (FERBER, 2010).

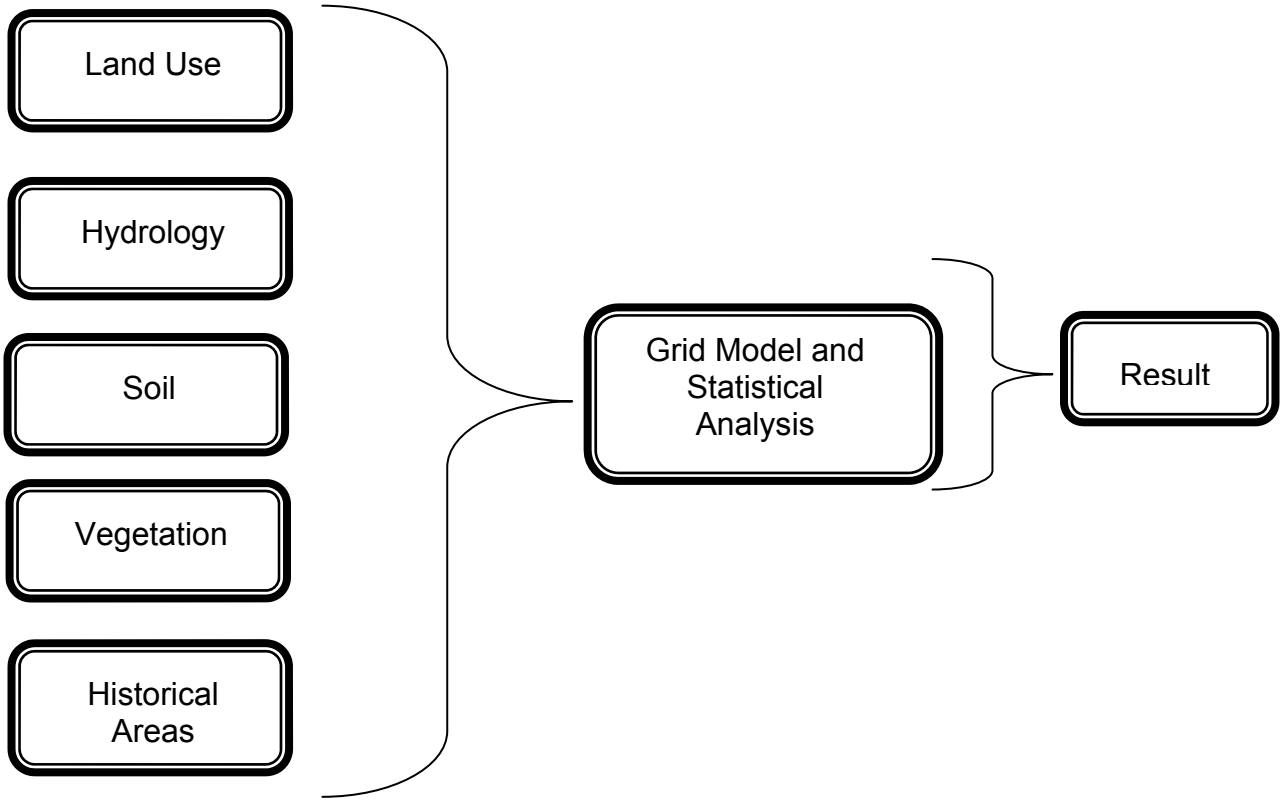
The SWOT analysis is used to identify the strengths, weaknesses, opportunities and threats in the study (MASON, 2011). *“Humphery (2004), one of the founding fathers of the SWOT analysis, claims that the SWOT analysis is a product of a study conducted at Stanford Research Institute from 1960-1970”* (MASON, 2011). The analysis points out that this method is one of the important analysis techniques for economic issues. The present-day SWOT method is the connecting point for analyzing every issue so that it is available to other professions (such as landscape architecture, city planning and architecture) using a clear and simple common language in their own perspective [57]. Additionally, it is well-known that design professions are highly connected with each other. For example, macro scale decisions (planning level) must be compatible with micro scale implementations (design applications). Nevertheless, the SWOT analysis does not cover all the issues from macro scale decisions to micro scale implementations in design professions. It is one of the important methods of analyzing macro scale development in cities and in design professions.

On the other hand, a grid model is used to analyze micro scale implementations for

land use development or current land use. Even so, it is not able to analyze the entire planning and design system from macro scale to micro scale. Each profession has its own set of analyzing techniques for these methods. This study employs mix method for analyzing macro and micro scales in abandoned areas. Mixed methods also help the use of multiple approaches in answering research question for Brownfield sites (JOHNSON and ONWEGBUZIE, 2004).

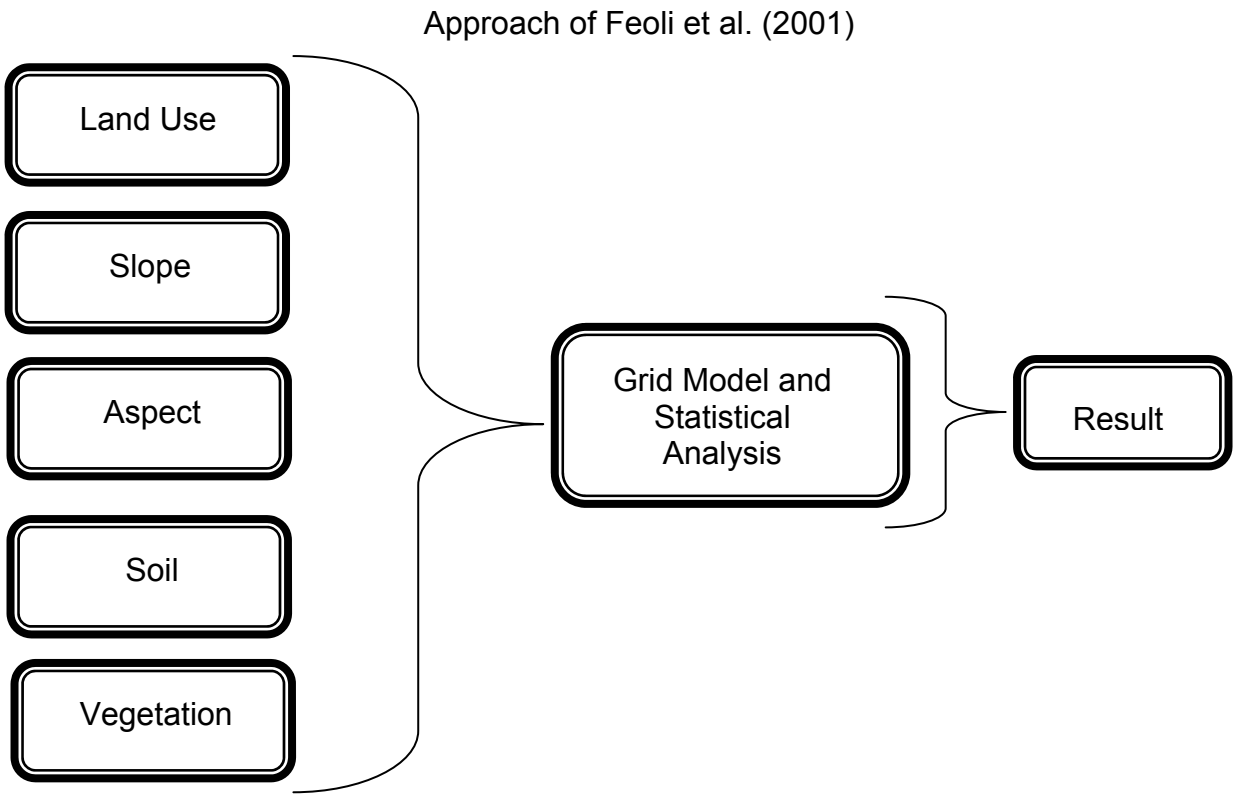
The grid method has been used in environmental research, and the experience with the method in a number of studies has proven that it is a useful technique for micro scale analysis (KERKHOF, 2004). According to Kuiper (1999), the grid method was structured in the following way for environmental research in his study:

Approach of Kuiper (1999)



Kuiper`s approach of including environmental resources in methodological process is about how much the quantitative effects of areas are taken into account (SPASH et al., 2005). But this systematic approach does not provide important tools for analyzing Brownfield areas from macro scale to micro scale (YENER, 2003). Enrico

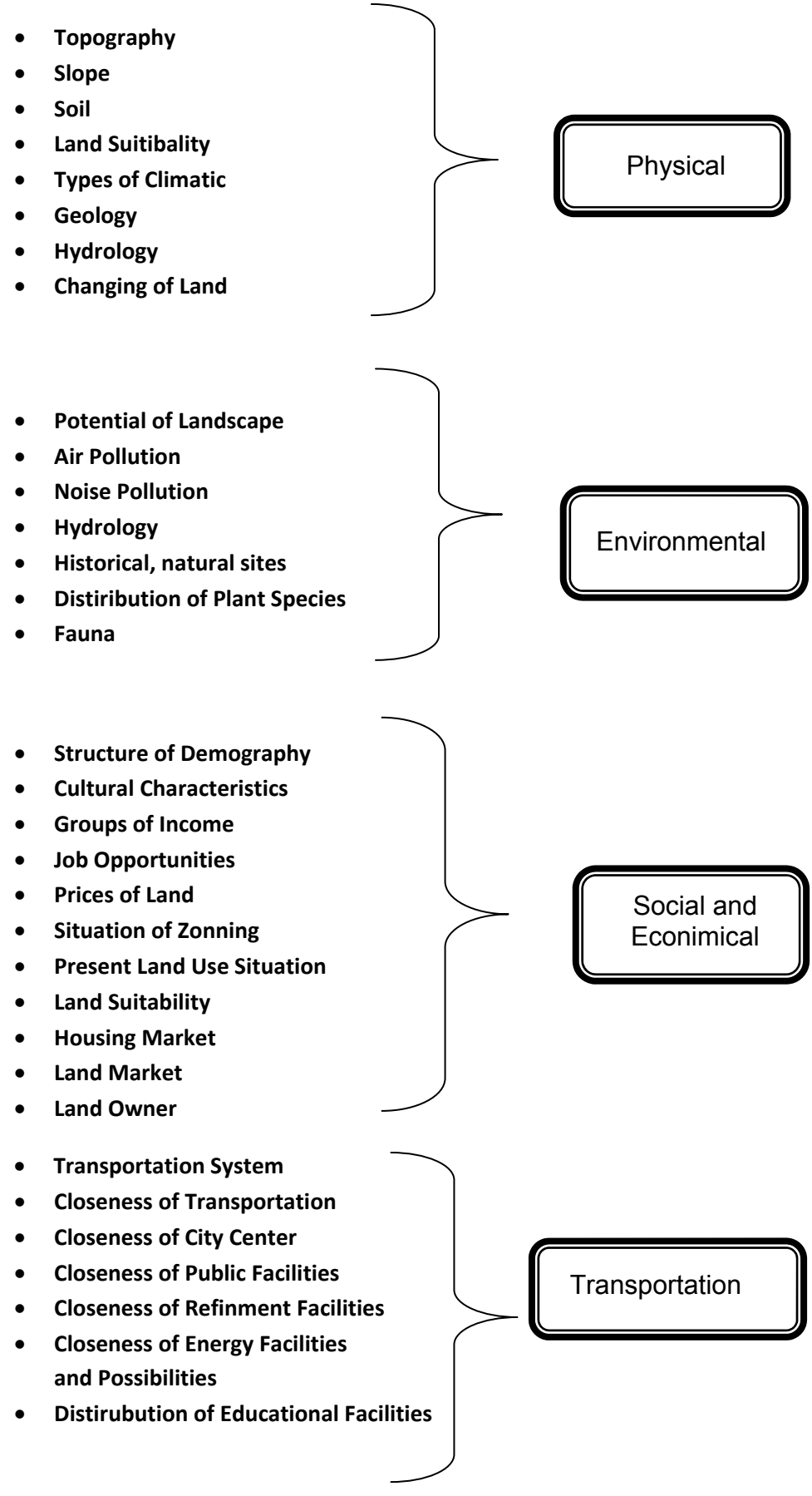
Feoli [11] et al. (2001) also used the grid method to systematically investigate landscape structure in environmental research field. The data evaluation in the study by Feoli et al. (2001) was organized as follows:

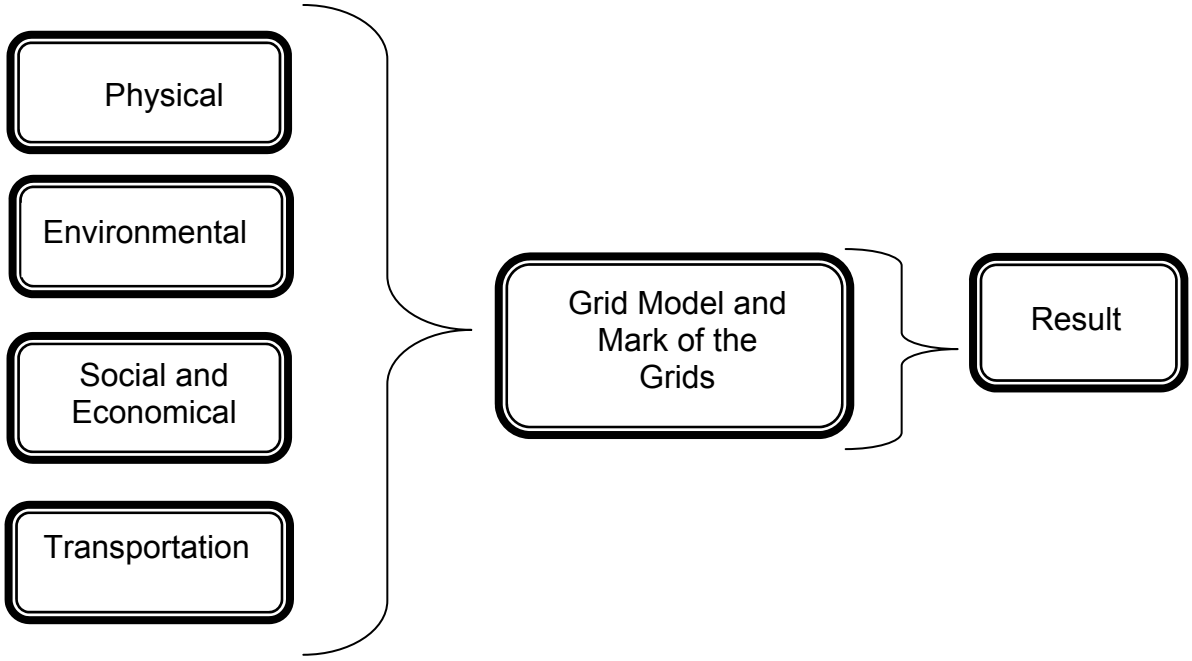


The grid method is very flexible and has no restriction regarding the type of any data in the analysis. In 1976, Golany Gideon tried to adapt it in planning studies. His research focused on land use analysis in urban development and he was one of the early researchers who utilized the grid method. During his research period, he saw a technological obstacle to efficient scientific analysis for grids in his study. He didn't have any certain areas of m^2 or number for the evaluation criteria, but he used the mark method for evaluating all the information in the grids. His evaluation defined the grids and focused on the uses within the grids. Even so, it was not possible to conduct a detailed analysis. Naturally, he has not established any connection between macro scale and micro scale in planning decisions and method implementation. He considered the following criteria in his studies:

[11] Feoli is the second author of this article, but the author of this dissertation carried out the study with Prof. Dr. Enrico FEOLI and learned this method from him in Greece. This is the main reason why the author cited his name and mentioned about the researchers who used this method previously in Environmental Studies.

Approach of Golany Gideon (1976)





Golany`s study shows the Grid Model has been used in or adapted by wide planning studies. Planning studies determine the impacts of a proposed action on city development, generally including changes in social, cultural, economic and ecological system (STYNES, 1997). On the other hand, the grid model is a micro-scale concept, and its analysis is dominated by geographical data and characterized by environmental and planning studies (UNGER et al., 2011). These studies make it clear that a combination of macro and micro analysis methods are not available for planning and environmental studies.

This study provides a transition from macro scale (planning decision) to micro scale (planning implementation) with the Grid analysis and SWOT analysis. The SWOT analysis particularly defines the general characteristics of Brownfield areas and it is very important for determination of macro scale analysis. This study uses a combination of the Grid model and SWOT analysis as one single method to start analysis from macro scale to micro scale on Brownfield Areas. It can also create a new method and provide a transition for the design professions (landscape architecture, architecture and urban planning).

The central approach of design professions such as urban planning and landscape architecture is to conduct studies on the same problems existing in the same areas.

(CHRISTENSENL and YAŞAR, 2007). The approach of design professions must have a similar understanding of the problem in order to provide the same solution. It is a fact that all design professions must use the same data for a solution for problematic areas. This means using the same approaches, exactly the same implementations and projects, and performing the same tasks in design professions. The method (The Grid model and SWOT analysis) used in this study provides a systematic approach to design professions and ensures that the method is suitable for analysis from macro scale to micro scale in Brownfield areas (AAKER, 2001).

Limitations of the SWOT Analysis

Currently, the SWOT analysis is generally used effectively in urban regeneration approaches as a scientific method within social, economic and ecological context. Although it is an important technique for urban regeneration, it seems to be far from fully analyzing the properties of the areas and unable to provide sufficient information about the field. The SWOT lacks data analysis such as slope, solar-space effect and geological structure for Brownfield redevelopment. It stays too far to define the characteristics of urban regeneration area and remains superficial for analyzing the prevailing conditions in areas. Consequently, it is obvious that the SWOT analysis is not enough to give an idea for the existing decision of architectural and environmental design on urban regeneration areas.

Limitations of the Grid Method with Hierarchical Cluster Analysis

The Grid Method with Hierarchical Cluster Analysis is used generally for environmental studies in an attempt to determine the characteristics of an area. This method is useful for micro scale investigations. Nonetheless, the method fails to capture the broad range of social, cultural and economic data analysis (CONSULTANTS, 2008). This method cannot provide sufficient data analysis in studies of urban regeneration on its own, but it can create a new methodological approach in combination with the SWOT analysis for urban regeneration projects. This deep thinking on the method helps complete the SWOT analysis as a creation of new methodological background in the investigation. The method helps to determine current and potential urban regeneration areas and contributes to healthy and

sustainable development in cities.

The application method of design professions (The SWOT – Grid Based Modeling with Hierarchical Cluster Analysis)

The quantitative and qualitative analyses present a holistic approach for urban regeneration areas. In this study, the new methodological approach consists of the SWOT – Grid Based Modeling with Hierarchical Cluster Analysis. This method is useful not only for urban regeneration areas but also for many planning studies. "*Although the elements defined are common to the Brownfield process, they should not be considered as requirements for all projects"* [4]. Depending on the nature of the site, scope of the project, and necessities of the areas, only some of these elements may be applied [4]. This study introduces the fundamental elements of quantitative and qualitative approach to research, to help understand the problem and become proficient in the new method [58].

Economic, ecological and social factors have come to the fore in abandoned areas as an important outline for urban regeneration studies. This study strongly emphasizes that the characteristics of areas are the most important part of the new approach. Current scientific approaches are not able to analyze the characteristics of the areas in potential Brownfield solutions.

For urban regeneration studies, the U.K. government used SWOT method in East Wales[12]. This study provided guidelines for our study in Zonguldak, Turkey. As a different statement in our investigation, we focus on three headings, namely economic, ecological and social fields for our research area in the SWOT analysis as a qualitative analysis. On the other hand, the Grid Based Modeling with Hierarchical Cluster Analysis is adapted and modified for urban regeneration areas as a quantitative method. Both quantitative and qualitative analyses are integrated into this study for evaluating evaluation and finding a solution for urban regeneration areas. A new approach to urban regeneration is to find a proper solution for abandoned areas with the application method of design professions.

[12] see the website www.wefo.wales.gov.uk/resource for more information

"Geographical data generally appear as part of an existing structure of regions. Yet it is the formulation of regional boundaries that may be a desired outcome of analysis rather than such boundaries being predetermined" (MASSEY, 1978; DUNN and WALKER, 1989; ROBINSON, 1998). From this perspective, cluster analysis can help to determine the boundaries of geographical data and analyze data similarities to find a solution approach. This method makes it easy to analyze all geographical data on urban areas. This will help to give a more specific solution through the combination that includes cluster analysis in Brownfield areas.

"Cluster analysis is based on correlation matrix, but it generally operates on one in a different form" (ROBINSON, 1998). Cluster analysis is the correlation matrix that determines the correlation between the characteristics of areas regarding a case study, which will help to understand the current problem in Brownfield areas for the best approaches to solutions. The cluster process is usually represented in the correlation matrix with dendrogram, so named because of its branching structure (ROBINSON, 1998). Clustering highly correlated pairs of observations takes place in the dendrogram at a level of correlation that is depicted in the original correlation matrix between all the observations (ROBINSON, 1998). The distance coefficient (d_{ij}) can be counted in the same branch and close to the bottom. It means that these regions are similar to each other.

"Hierachical clustering requires a measure of similarity between groups of data points" (BLEI, 2008). It is used agglomerative hierarchical cluster analysis for the data evaluation in this study. According to the Noor et al. (2011), Agglomerative hierarchical cluster analysis is described as *"clsutering of each observations or objects begins in seperate clusters and the clusters of object or observation that are close together are merged to create one large cluster".* The general formula is given for agglomerative hiearchical cluster as follows (TEKNOMO, 2009; NOOR et al., 2011);

$$d_{k\rightarrow (r,\,s)}=\alpha_r\, d_{k\rightarrow r}+ \alpha_s\, d_{k\rightarrow s}+\beta\, d_{r\rightarrow s}+ \gamma$$

Agglomerative hierarchical cluster analysis is used with complete linkage method for

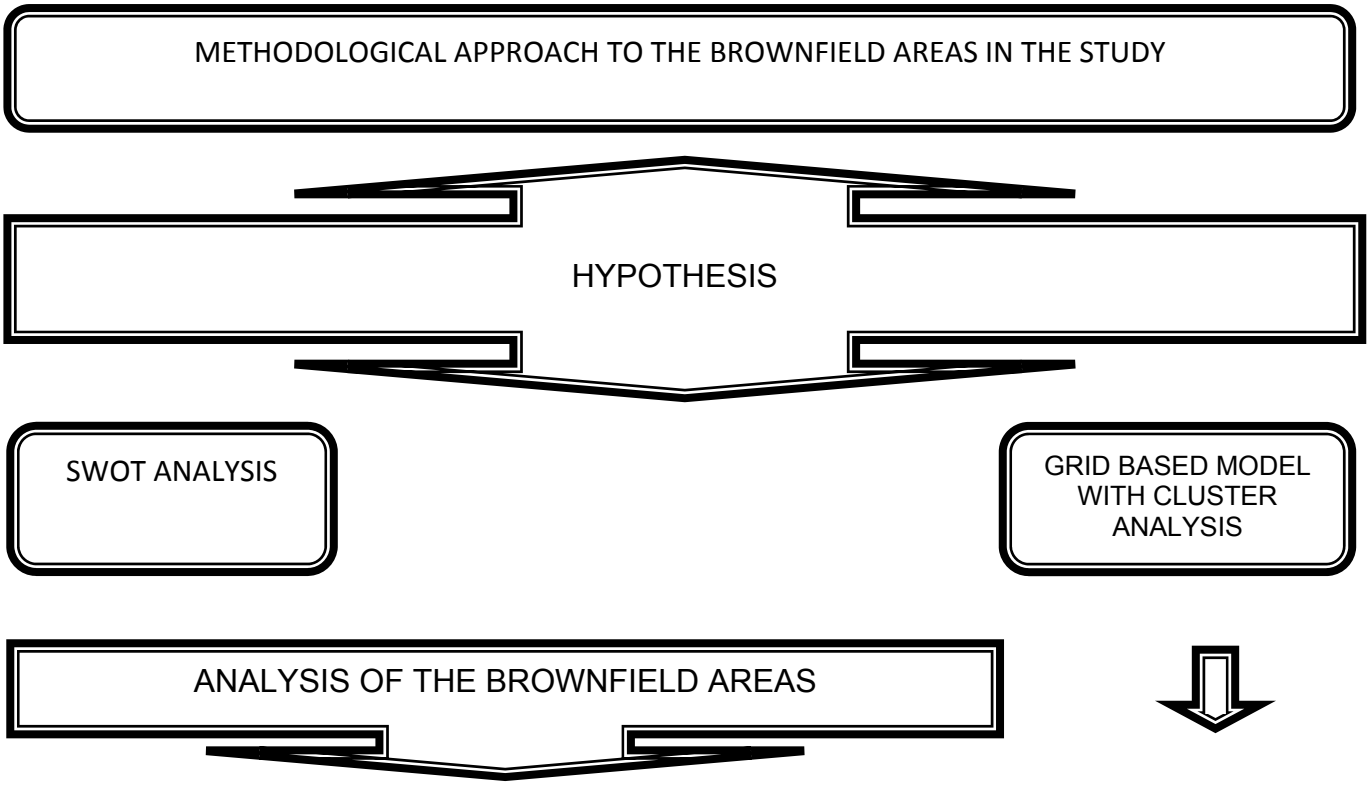
creating cluster from available data. Complete linkage method is defined as *"The distance two clusters is based on the points each clusters that are furthest part"* [59]. The general formula and description are as follows [59];

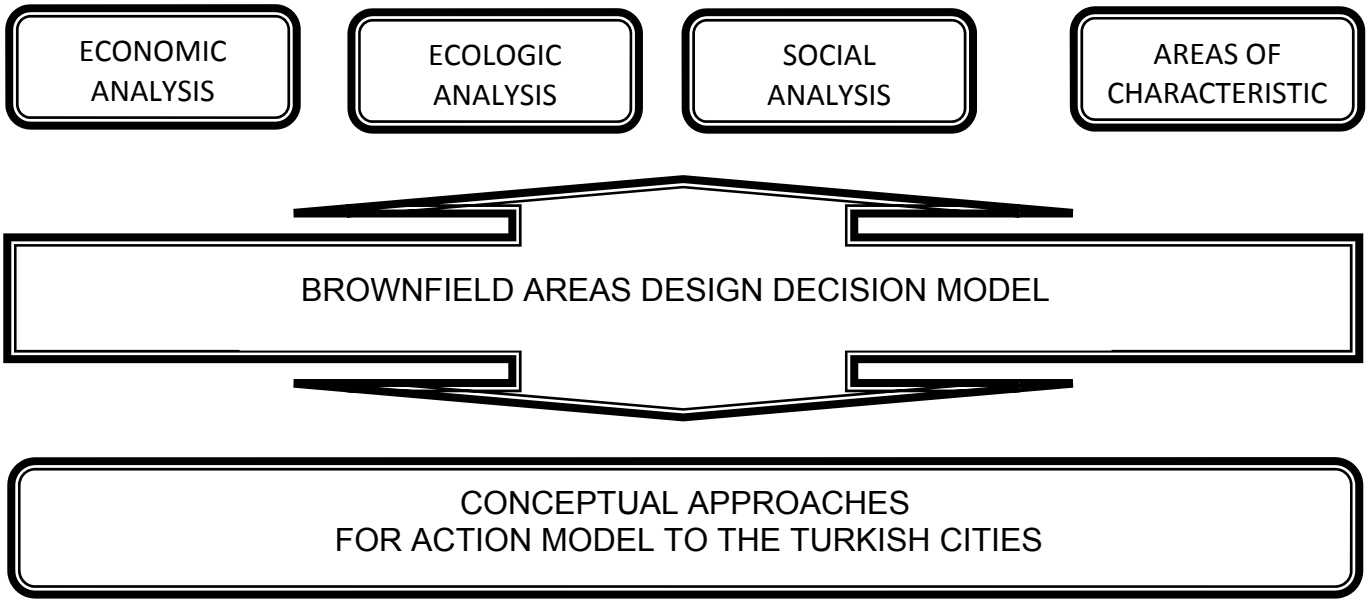
$$D_{KL} = \max_{i \in C_K,\ j \in C_L} d(x_i, x_j)$$

The SWOT analysis addresses the current state of physical, economic, social and environmental factors in city development for Zonguldak. The Grid Based Modeling with Hierarchical Cluster Analysis considers the factors in the characteristics of areas in Brownfield areas. The quantitative and qualitative analyses describe various characters and features of the areas.

This study has the potential to determine an appropriate solution for the abandoned problem in other Turkish cities. The central approach of this study is to find an accurate solution for abandoned sites in cities. This new methodological approach in this study can be described through the headings presented below (Figures-4.8);

Figure-4.8: Methodological Flow Chart for the Dissertation





Source: Mustafa ERGEN, 2009, (Author`s own construct)

The purpose of the mixed method analysis is to identify an appropriate solution approach for Brownfield redevelopment. A connection is developed among economic, ecological, social and geological issues in an attempt to understand the problems in Brownfield areas in a scientific manner.

ECOLOGICAL SWOT

The scenery of the region is primarily the Mountains in the Black Sea Coast that extend from the east to the west and arable plains, valleys and streams (ANONYMOUS, 2006). The mountains in the Western Black Sea Region lie parallel with the coast (ANONYMOUS, 2006). The southern part of the mountain system has a three-sequence structure (ANONYMOUS, 2006). The first sequence rises until 1000 m, under which coal beds are available (ANONYMOUS, 2006). The second sequence rises as high as 1500 meters (ANONYMOUS, 2006). The height of third sequence is approximately 2000 meters (ANONYMOUS, 2006). Panayır Hill of northern Safranbolu, Bacaklıkaya Hill of Ereğli and Keltepe Hill of southwestern Karabük are the highest points in the region (ANONYMOUS, 2006). 67% percent of the region is hilly, whose slope is generally more than 20% (ANONYMOUS, 2006). The remaining other 33% of the region has a slope of less than 20% where areas are suitable for urbanization and industrial development (ANONYMOUS, 2006). With a

slope of 0-10%, Ereğli, Bartın and Safranbolu are the best places for settlement around Zonguldak (ANONYMOUS, 2006).

The region has two major water basins (ANONYMOUS, 2006). The Sakarya Basin covers southern Bolu whereas the Kızılırmak Basin covers northern Bolu, central and southern Zonguldak and middle and southern Kastamonu in the region (ANONYMOUS, 2006).

Bolu has two river basins (ANONYMOUS, 2006). The Efteni basin is a small one located entirely within the boundaries of Düzce (ANONYMOUS, 2006). The Sakarya and Filyos river basins flow into the sea from the surrounding provinces (ANONYMOUS, 2006).

The River Filyos has three main streams, namely Büyüksu, Mudurnu and Ulusu (ANONYMOUS, 2006). Büyüksu comes from Lake Abant and flows towards the north combined with the Creek Mengen (ANOYMOUS, 2006). When the Creek Mengen enters Zonguldak, it is called the Creek Devrek and joins with the Creek Filyos in southern Çaycuma (ANONYMOUS, 2006).

Ulusu starts from Mountain Köroğlu and flows towards the northeast (ANONYMOUS, 2006). It flows from southern Çankırı to Zonguldak, where it is called the Creek Gerede (ANONYMOUS, 2006). The Creek Ulusu reaches the Black Sea, where it is called the Creek Filyos (ANONYMOUS, 2006).

The main streams of the Sakarya Basin are Mudurnu, Aladağ, Göynük and Çatak (ANONYMOUS, 2006). The Creeks Mudurnu and Çatak converge into the Stream Sakarya (ANONYMOUS, 2006). The Creek Aladağ, on the other hand, converges into the Sarıyer Dam (ANONYMOUS, 2006).

The River Filyos is named after the merger of the Creeks Yenice and Devrek in Zonguldak's district of Tefen (ANONYMOUS, 2006). The removal or destruction of plant species results in a disrupted balance between soil and water in the region. The River Filyos has a few tributaries at stagnant times, but after the rain there becomes a flood (ANONYMOUS, 2006). The flood starts from Tefen in the Filyos Valley

(ANONYMOUS, 2006). It covers approximately 3% of the whole Zonguldak (ANONYMOUS, 2006).

Most of the lakes in the Western Black Sea are found in Bolu, which is near to Zonguldak (ANONYMOUS, 2006). These lakes are small but have touristic value. The name of the lakes are as follows: Abant Lake, Çağa Lake, Çubuk Lake, Kara Lake, Efteni Lake, Sunnet Lake and Seven Lakes (ANONYMOUS, 2006).

Forests are the dominant vegetation in the Western Black Sea. The richest forests cover this part of the country. Out of 7000 plant species in Turkey, more than half exist in this region (ANONYMOUS, 2006). Many species of plant are found at a height of 1900 to 2000 m. (ANONYMOUS, 2006). Karadere, Seben and Aladağ Forests require urgent conversation for the flora and vegetation in the region (ANONYMOUS, 2006).

The Western Black Sea region has the least precipitation in the Black Sea region (ANONYMOUS, 2006). Generally, the precipitation is experienced most often in summer and autumn in the region (ANONYMOUS, 2006). The average annual precipitation is between 700-1000 mm (ANONYMOUS, 2006). The average annual temperature is similar to that of the Eastern Black Sea region. Winters are very cold, whereas summers are very hot (ANONYMOUS, 2006).

Strengths

- Zonguldak has major attraction areas around it that can be used for visitors with its natural background
- Strong ecological features
- Strong clean and green image
- Endemic flora and fauna for the ecological regulations
- Zonguldak could be use the natural areas for the new development approaches like ecotourism

Weakness

- Derelict areas affected environment by land contamination
- Derelict areas gave a bad image to the urban environment
- Lack of rethinking ecological approaches for derelict areas

Opportunities

- Focus on high value ecological features with growing potential
- Redevelopment and regaining derelict areas with natural features
- Development of high quality environment in sustainable ways

Threats

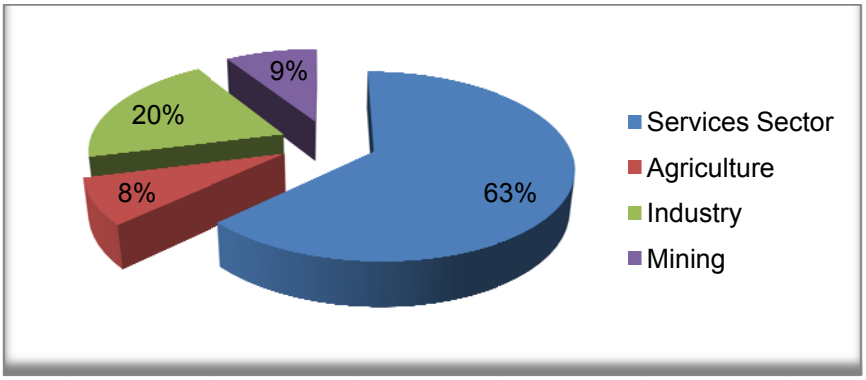
- Damaging the environment by having wrong decisions for the new development
- Lacking of natural thinking for the solution
- Lacking of sustainable approaches to the derelict areas
- Lacking of environmental management for regaining derelict areas

Regarding Brownfield approaches, any implementation requires a broad and deep understanding of the current environmental situation. Conducting an environmental potential is the most commonly used process that creates the solution options in successful approaches to Brownfield areas. An environmental potential helps to develop an internal and external solution approach to Brownfield areas. The results of this analysis can be used to help 1- provide fundamental approaches to the environmental potential 2- gather data for potential solutions 3- ensure effective use of Brownfield areas within the solution. As a result, Zonguldak has strong solutions in terms of environmental potential for Brownfield areas regarding the ecological SWOT.

ECONOMIC SWOT

The economy of Zonguldak depends mainly on the TTK. The TTK gradually reduced levels of employment in the last two decades. Accordingly, the problem of unemployment in Zonguldak has increased significantly. The TTK decided to get involved in downsizing just after the 1994 crisis, but rates of Gross National Product (GNP) increased in 1997 (ANONYMOUS, 2006). Besides, industrial sector (Ereğli enjoys strong industrial sector because of its steel-iron factory, which is operated by the government) also increased 368% in 1997(ANONYMOUS, 2006). Although the TTK and Erdemir are nationwide firms and have high income of GNP in Zonguldak, GNP doesn't really reflect the standards of living in the region (ANONYMOUS, 2006).

Figure-4.9: Division of Zonguldak City GNP by Economic Sector



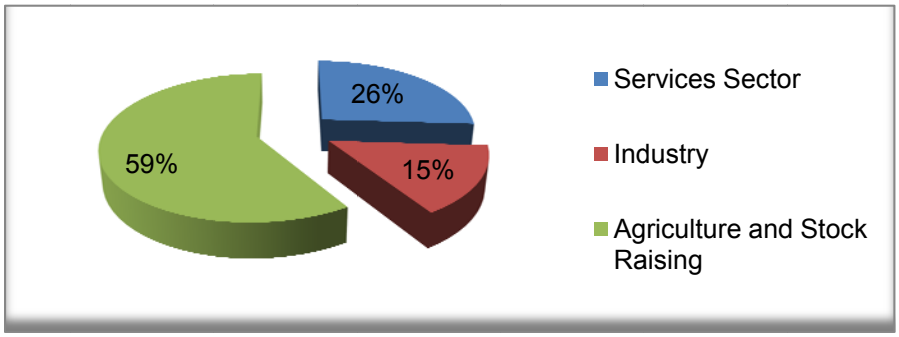
Source: [56]

A look at the sectors in Zonguldak reveals that services sector is ranked first with 63% in terms of GNP values (ANONYMOUS, 2006). It is followed by industrial sector, which is ranked second with 20% GNP, mining sector ranked third with 9% GNP and agriculture sector ranked fourth with 8% GNP (ANONYMOUS, 2006). The sectors are observed to have undergone certain changes between 1988 and 2000. For instance, agriculture sector decreased from 11.8% to 8% GNP; mining sector decreased from 12.1% to 9.2% GNP; industrial sector increased from 18.6% to 20.3% GNP; and services sector decreased from 50.4% to 63% GNP (ANONYMOUS, 2006).

The agriculture sector in Zonguldak was below the Turkish average until 1990 (ANONYMOUS, 2006). In 2000, however, the sector increased through public investment (ANONYMOUS, 2006). Even so, it was still ranked last in the Black Sea Region (ANONYMOUS, 2006). Labor force in the sector is ranked first with 59% in Zonguldak (ANONYMOUS, 2006). The main economic development is based on the TTK and the iron-Steel factory in Ereğli (ANONYMOUS, 2006). Nevertheless, these are not enough to provide a wide range of employment opportunities for the industrial sector (ANONYMOUS, 2006). Between 1980 and 2000, Zonguldak was still not below the Turkish average or Black Sea Region. By GNP values, the industrial sector is ranked second in terms of employment, being second only to the agricultural sector (ANONYMOUS, 2006). The industrial rate of employment in Zonguldak is as follows: 35% for the TTK, 13% for Erdemir, 1.1% for the Thermal Power Plant in Çatalağzı and 0.9% for SEKA Paper Factory in Çaycuma (ANONYMOUS, 2006).

In terms of employment, services sector in Zonguldak was below the Turkish average between 1980 and 2000 (ANONYMOUS, 2006). On the other hand, Zonguldak serves as a center of health services for other cities (ANONYMOUS, 2006). Additionally, the TTK creates and supports a larger services sector in the city (ANONYMOUS, 2006). With respect to these facts, services sector was ranked first with 63% GNP in the city (ANONYMOUS, 2006).

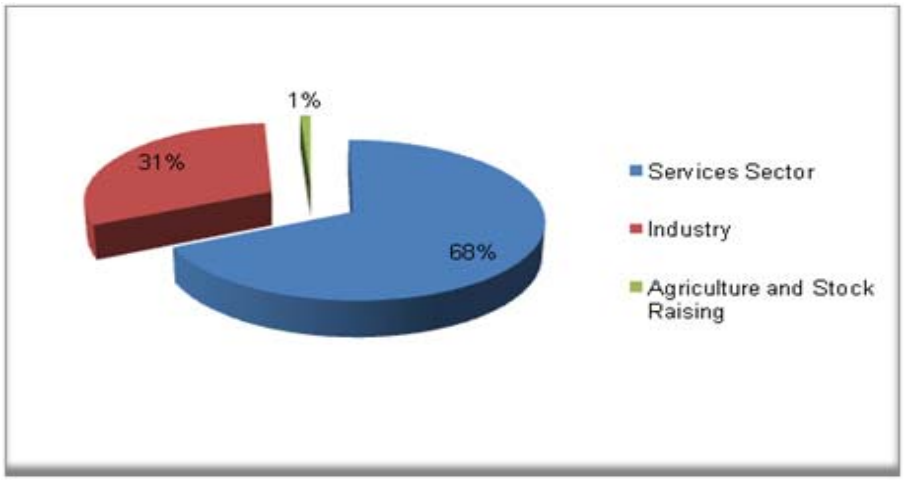
Figure-4.10: Economic Sectors of Zonguldak City



Sources: ANONYMOUS, 2002

In Zonguldak, 41% of the employment is comprised of officers, while the remaining 59% is comprised of workers (ANONYMOUS, 2002). The mining sector still has great importance in Zonguldak, which can be explained by the fact that the working class constitutes the majority of the members of the sector. The city ensures more importantly 85% of the workers in the city are public workers (ANONYMOUS, 2006). Clearly this shows that Zonguldak economy is highly dependent on mining sector. Coal mining has been of great importance for many years in the city, but it has not been able to receive any investments over the years.

Figure-4.11: Economic Sectors of Zonguldak City Center



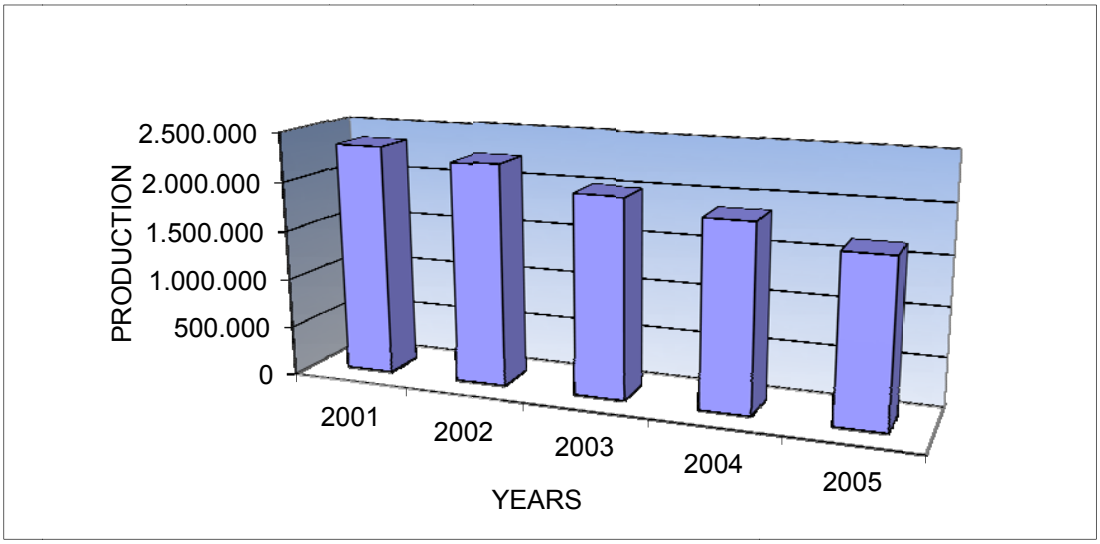
Source: ANONYMOUS, 2002

A look at the sector distribution in the city center indicates that 68% of the employment is provided by the services sector; 31% by the industrial sector; and 1% by the agriculture sector (ANONYMOUS, 2002). When the mining sector declined in the city, it was obvious that the city center could not provide any other option for economic development. As can be concluded from the table**,** the agriculture sector is the second biggest in Zonguldak, but the city is geographically located on a hilly area. For that reason, the agriculture sector cannot prove to be the solution for the current problem.

The economic and demographic conditions in Zonguldak include the shrinking problem, which has an influence on the development of the city. Zonguldak also need to consider that condition as an advantage within a new economic option. But currently, the phenomenon of shrinking has general symptoms such as decreased population and shut-down industries in the city. Furthermore, the situation leads to decreased production in industrial areas.

The TTK is the most important economic component in Zonguldak. Unfortunately, this economic benefit started to lose its crucial effect on the city. The TTK has decreased the number of its employees, which, in turn, has had an effect on coal production. The annual coal production growth rate has dropped dramatically in recent years (Figure-4.12) and Zonguldak has started to suffer from shrinking problem.

Figure-4.12: Turkish Hard Coal Foundation Production from 2001 to 2005



Source: ANONYMOUS, 2007

From the figures, it is apparent that the city has been shrinking ever since 2001 depending on decreased coal production. There is a clearly defined pattern in the figure, which might mean that demographic and economic conditions are worsening in Zonguldak. This situation can provide not only some advantages but also disadvantages to city development, which can be try to defined in the SWOT analysis as follows;

Strengths

- Strong coal mining background
- Zonguldak is located in Black Sea which is conjunction of the transportation and is useful shore as a touristic attractive
- Zonguldak open to the new development approach and investment
- Zonguldak has a regeneration area as a potential of development place with new economic background
- Large number of service sector for the development potential

Weakness

- High levels of unemployment
- Zonguldak needs local employment opportunities
- Zonguldak needs to attract to economic investment
- Concentration of economic approach for the abandoned area

- Coal mining is the one of the industry, not having the others

Opportunities

- Potential of redevelopment derelict areas for economic use
- Attraction to the investment on the redevelopment areas
- Use of potential to the natural areas for the economic facilities

Threats

- Declining areas cause adverse problem on the economic site like losing tax
- Sustain of declining urban economy day to day
- In a globalization development competition with the other cities in an economic background

The rapid change in economic growth is an unanticipated result in the city; it is the reason why the city has had to face unexpected challenges. Brownfield areas have brought about the lowest incomes and created unemployment in the city. Migration and declining economy shows that this drastic development in Zonguldak can have a long term impact on city development. It should be noted that shrinking city problem has a number of negative impacts on urban development. Therefore, Brownfield areas in Zonguldak need a solution in global economic development.

SOCIAL SWOT

The table presents the demographic distribution in the center of Zonguldak and its districts. According to the table, Ereğli has the highest population with 159,808 people, only second to the center of Zonguldak, whereas Gökçebey has the lowest population with 25,588 people (Table-4.1).

Table-4.1: Zonguldak City 1990-2000 Population Growth Rate

	1990*			2000			Annual Population Growth (%)		
District	**Total**	**Urban**	**Rural**	**Total**	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
Merkez	249610	117975	131635	218722	104276	114146	-6.01	6.07	-13.51

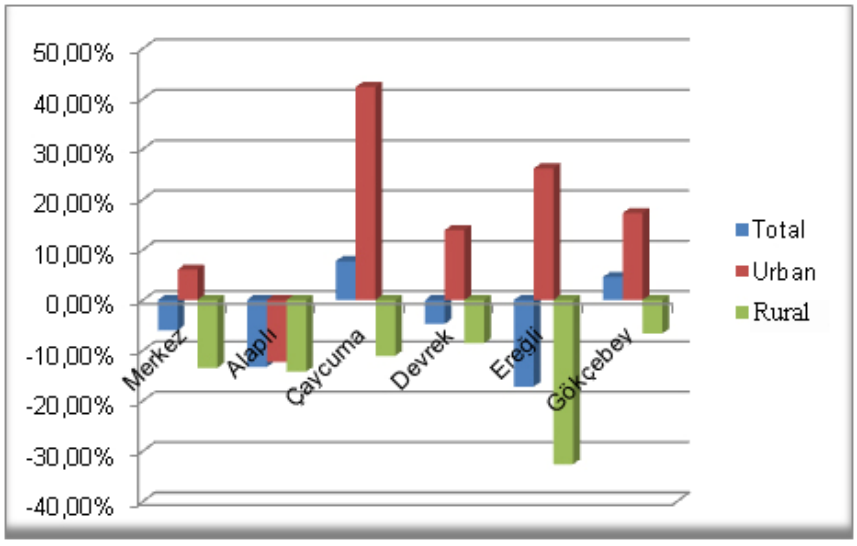
Alaplı	41267	12105	89283	44578	18487	81951	-13.34	-12.34	-14.25
Çaycuma	105586	16303	89283	100685	18734	81951	7.72	42.33	-11.12
Devrek	79028	16442	62586	66518	21360	45158	-4.75	13.90	-8.57
Ereğli	152710	66859	85851	159808	79486	80322	-17.23	26.16	-32.63
Gökçebey	25538	5862	19676	25588	7939	17649	4.54	17.29	-6.66
TOTAL	**653739**	**235546**	**418193**	**615899**	**250282**	**365317**	**0.20**	**30.32**	**-10.87**

Source: ANONYMOUS, 2002

Table 4.1 shows that the highest annual population growth rate is in Çaycuma with 7, 7% whereas the lowest one is in Ereğli with -17, 2%. According to the General Population Census taken in 2000, the population of Zonguldak is 615,599. While 250,282 live in urban areas, the remaining 365,317 live in rural areas. Total population growth rate of the city center is -6.01%.

A look at the population of Zonguldak (between 1990 and 2000) suggests that Çaycuma has the highest urban population rate of all the districts whereas Alaplı has the lowest urban population rate. Ereğli has the lowest rural population growth rate with -32.63% while Gökçebey has the highest one with -6.66% (Table-4.1).

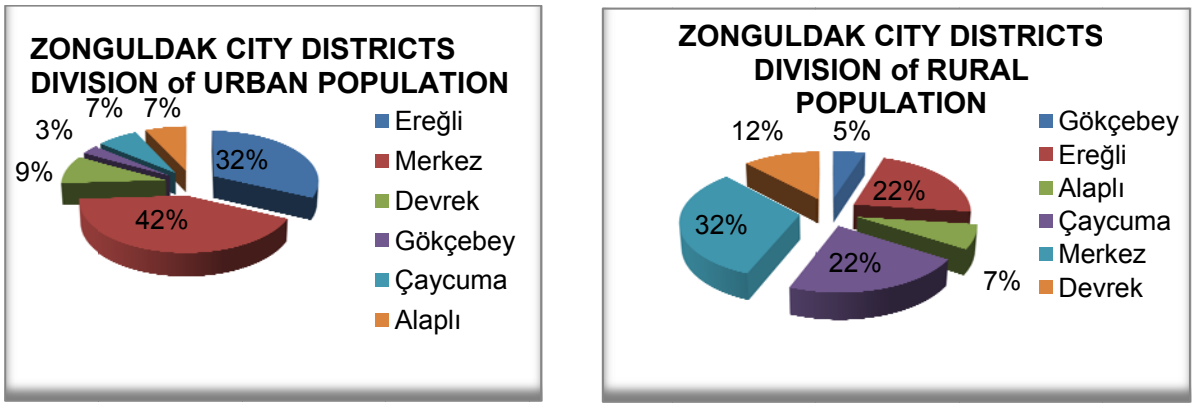
Figure-4.13: Annual Population Growth Rate of Zonguldak (%)



Source: ANONYMOUS, 2002

As can be seen from the figure, annual population growth rates in urban areas and rural areas are 0,067% and -1,351% respectively in Zonguldak. The annual population growth rate of Zonguldak is -0,601% (ANONYMOUS, 2002).

Figure-4.14: Zonguldak City Districts Division of Urban and Rural Population (2000)



Source: ANONYMOUS, 2002

Generally, the population of Zonguldak has been increasing in urban areas at a higher level than rural areas, but the population is still migrating to other cities, which is caused by unemployment. The SWOT analysis has been introduced into the current social situation in the case study, which describes the advantages and disadvantages of the problem to Zonguldak.

Strengths

- Strong historical heritage for mining development
- Strong cultural life style
- Large number of potential cultural heritage for the compete with the other global cities
- Strong cultural connection in urban structures in neighborhood planning

Weakness

- Lack of local production for the cultural promotion
- Migration trends affected negatively the urban development
- Derelict areas pointed out a social cohesion problem
- Lack of alternative employment opportunities for the public

Opportunities

- Provide a maximization of the benefit for the tourist attraction on the area
- Regaining and reuse to the derelict areas for the public
- Create employment opportunities for the local public profit
- Focus on cultural background in a global competition factors

Threats

- Declining areas become a problem for the social differences
- Declining areas become inactivity areas for the social movement
- Migration is changed to the social character the urban development

The first approach to the analysis is to determine how the city is currently affected in the social dimension. The migration has become one of the most important problems in Zonguldak. Even so, the city has many options to create employment opportunities for its people. Especially, Zonguldak has historical heritage in coal mining areas that can help to reveal job opportunities for its people in city development.

Grid Based Modeling with Hierarchical Cluster Analysis

Zonguldak is characterized by the economic potential of coal mining. This is reflected by many types of economic and social movement in Zonguldak. In order to use different factors, influences and their effects on coal mining areas, scientific studies need to determine powerful methods and tools.

Different methods of investigation for data analysis are based on matrices. Each of these matrices is used for defining all the areas in Zonguldak. In this case, a comparison and test will be conducted on the relation between matrices.

The purpose of this study is to find a proper solution for Brownfield areas in Turkish cities. An analysis of economic, geographical, ecological and social conditions provides a characterization of Brownfield areas. The present study displays solutions for Brownfield areas in Turkey and a new potential solution for abandoned sites.

In this investigation, the Grid Based Modeling with Hierarchical Cluster Analysis uses

factors of slope, aspect, geology and land use. Generally, the topography of Zonguldak is composed of hilly areas, which results in a planning problem for settlement and development planning problem in the city. For this reason, slope is one of the important research elements for defining solutions for Brownfield areas.

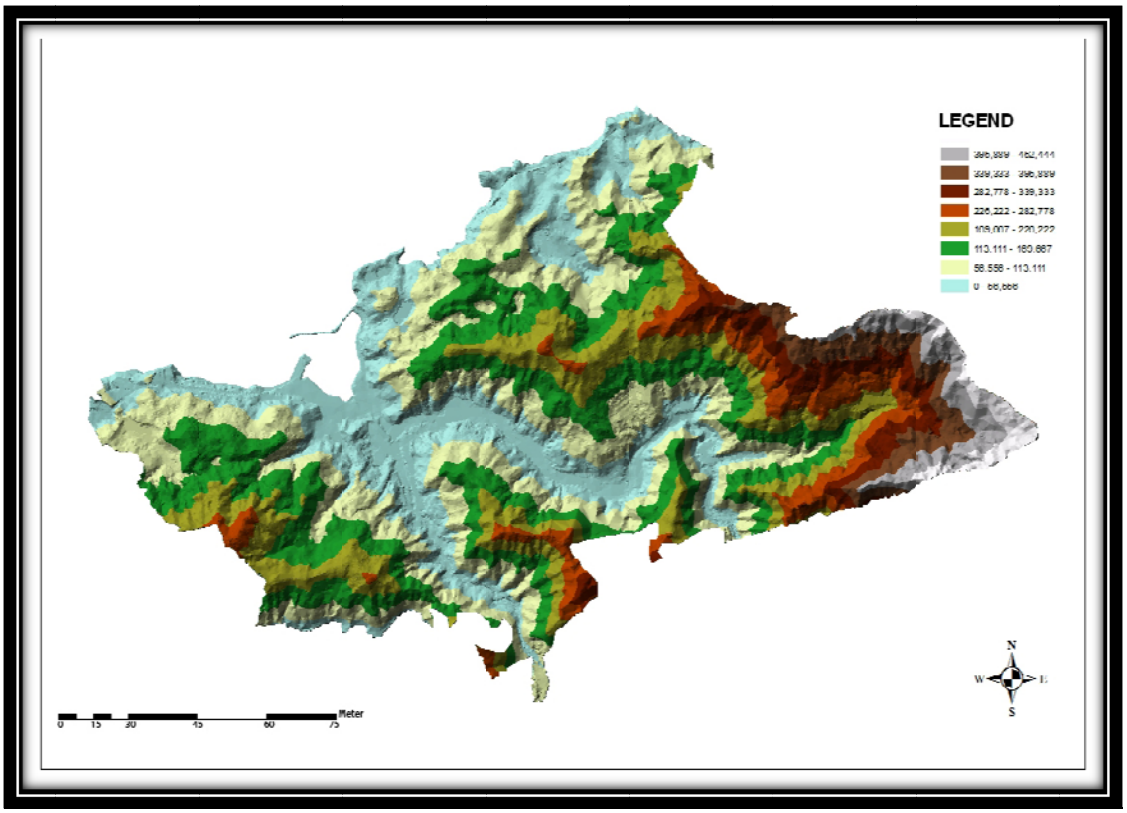
Table-4.2: Analysis of High Zones in Zonguldak City Center

HEIGHT (m)	AREA(ha)	RATE(%)
0-10	93.03	3.88
10-20	88.63	3.69
20-50	307.47	12.81
50-100	533.93	22.25
100-200	820.03	34.17
200-300	308.15	12.84
300-400	148.45	6.19
400-500	99.11	4.13
500+	0.83	0.03
TOTAL	2399.62	100.00

Source: ANONYMOUS, 2006

Many slope areas are decidedly inferior places to settle down (MARSH, 1998). Many communities recognize this and require information on slopes to help guide development decisions such as gently sloping sites are usually necessary for industrial and commercial buildings (MARSH, 1998). The topography is one of the important elements for land use and for further development options. The topography of Zonguldak is one of the obstacles to new development options in the city. The reason is that Zonguldak is mountainous and hilly (Figure-4.15), which cannot possibly allow for settlements in the city.

Figure-4.15: 3D View of Zonguldak Topography

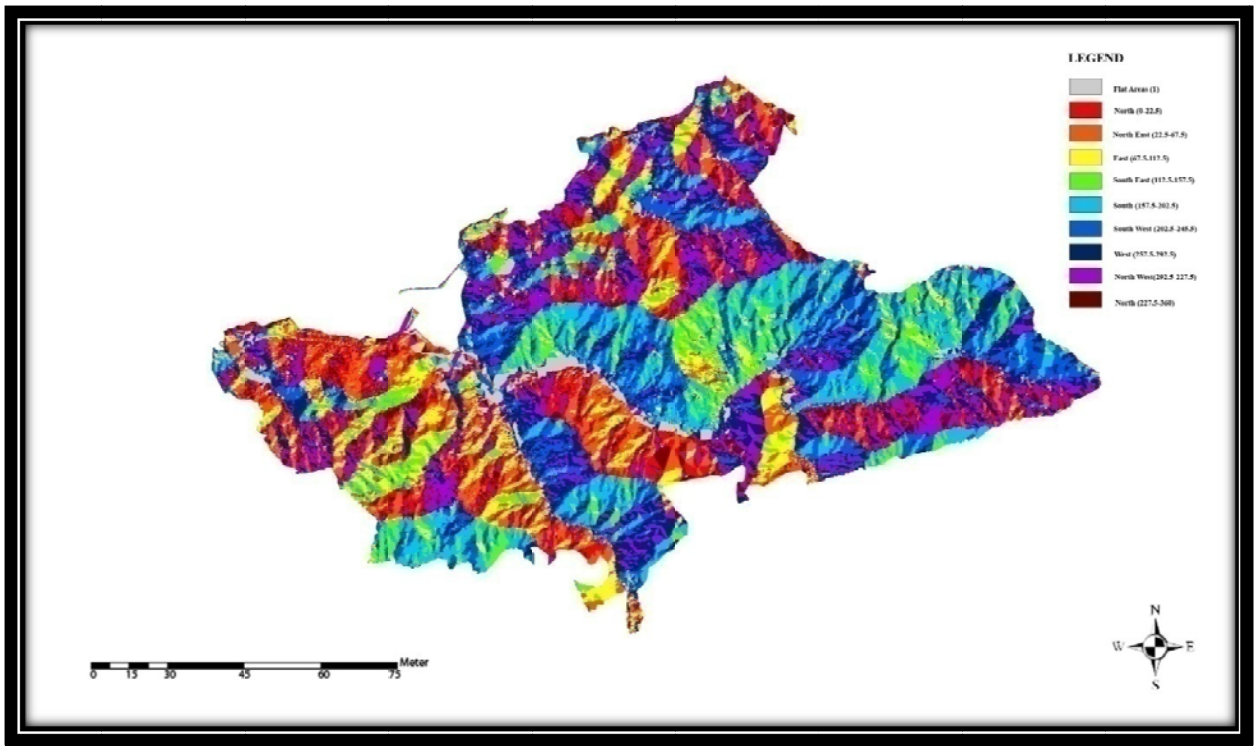


Source: ANONYMOUS, 2006

A look at the high points in the center of Zonguldak suggests that the highest area has a height of 509 m. In the city, areas are most commonly concentrated between 100 and 200 m, the zone with the highest rate approximately 34%- (Table-4.2). In the analysis, the slope map is reclassified as 0-15%, 15-30% and over 30% (Appendix-II), which helps identify suitable development options for the whole the city.

"The angle formed between sunlight approaching the earth`s surface and the surface itself is called sun angle" (MARSH, 1998). An analysis of sun angle could help to understand topographic advantage for the design approach. Aspect is an important factor in heating in abandoned sites. The sun angle depending on topography has an influence on design approaches and solutions. The map (Figure-4.16) reveals that red and red-like colors describe the northern topography. As we know, the northern part of topography is not useful area for architectural design. These areas may be designed as green areas and recreational opportunities within the framework of the development option.

Figure-4.16: Aspect of Zonguldak City

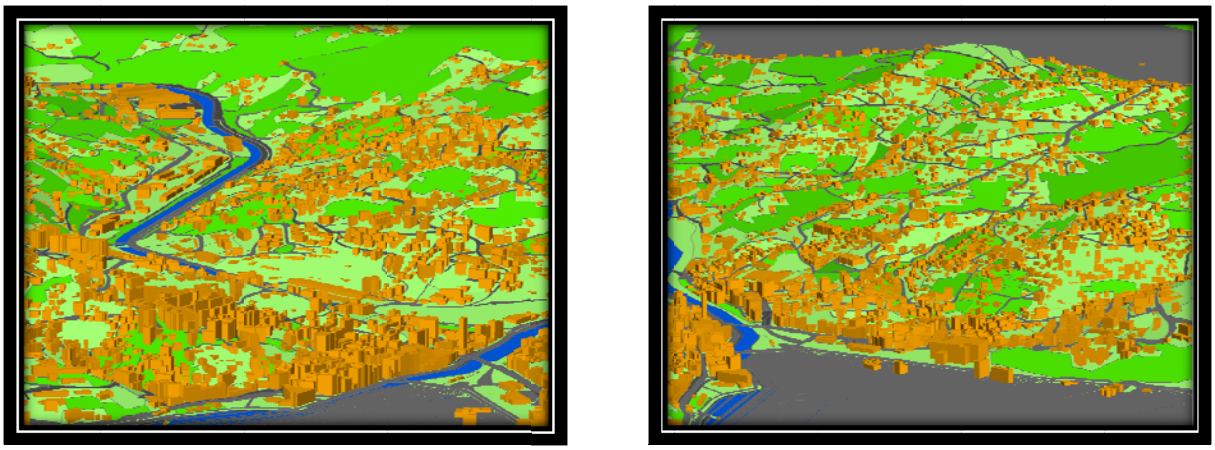


Source: ANONYMOUS, 2006

Aspect is one of the important elements in Brownfield areas, which can give an option how to use sunlight for designing urban Brownfield areas. Approximately 30% of Zonguldak is located in the north and northwest, which is possibly not useful for settlement (ANONYMOUS, 2006). An aspect map is also reclassified to determine suitable settlement areas. Number 8 refers to the South, Southeast and Southwest,; number 7 refers to the North, Northeast and Northwest; and number 4 refers to the East and West where sunlight is more favorable when compared to the other parts (Appendix-III).

The topography of Zonguldak is not favorable for settlement. Aspect is also one of the other obstacles in abandoned areas of Zonguldak. The current dwelling areas are located on flat terrains although some of them are even settled on hilly places in Zonguldak (Figure-4.17). This dense settlement development cannot provide any option for new development in the city center. From this perspective, abandoned areas can provide new development options and new dynamics for further planning approaches in the city.

Figure-4.17: Current Situation of Settlement in Zonguldak



Source: ANONYMOUS, 2006

Geology can give an idea about how to approach Brownfield areas in terms of solutions and how to reconstruct these areas based on geological conditions. ARE Geotechnical Engineering Ltd. Co.[13] prepared Reconstruction Plan Basics Geological-Geophysical-Geotechnical survey for an area of approximately 2500 ha which are threatened by earthquakes and all other natural hazards and risks in the center of Zonguldak. The plan was approved by the General Directorate of Disaster Affairs (Appendix-IV). According to this report, the geography of Zonguldak is defined as follows;

- *Yılanlı Formation (DCy)*

This formation is the oldest unit covering the whole study area. The Yılanlı formation belongs to the Middle Devonian-Lower Carboniferous period. The bottom is composed of siltstone and nodular limestone whereas the top is composed of gray-black colors, laminated mid-thick limestone layer, dolomite limestone and dolomite. The formation covers the neighborhoods Asma, Birlik and Çaydamar in the city center.

- *Formation of Alacaağzı (Ca)*

The second basic unit in the study area is the Alacaağzı Formation of the Namuriyen period that is called the Alacaağzı formation. Mudstone and sandstone created this

[13] Translation from Anonymous, 2006, "Zonguldak Belediyesi Genel Yaklaşım Raporu", Modül Planlama Harita Bilgisayar İnşaat ve Ticaret Ltd. Şti., Ankara

formation. This formation is found in the neighborhoods Baştarla, Asma, Bağlık, Birlik, Çaydamar, Çınartepe, Dilaver, İnağzı, Karaelmas and Tepebaşı.

- *Kozlu Formation (Cko)*

In the wide research area, the third basic unit is called the old Kozlu formation of Westphalia. The Kozlu formation is the most important carboniferous unit and composed of carbonated mica sandstone, medium-coarse grained stone, pebbly stone, massive and horizontal of stratum conglomerate, mudstone with rich organic matter and veins of coal. This formation is found in the neighborhoods Asma, Birlik, Bağlı, Bahçelievler, Baştarla, Çaydamar, Dilaver, İnağzı, İncivez, Karaelmas, Mithatpaşa, Meşrutiyet, On Temmuz, Tepebaşı, Terakki and Yeni.

- *Karadon Formation (Cka)*

A review of the wide areas, suggests that the fourth basic unit is Westphalia of the old Karadon formation. The formation is composed of conglomerate, sandstone, clay stone and diatomite. The formation is found in the neighborhoods Bahçelievler, Birlik, Dilaver, İnağzı, İncivez, On Temmuz and Terakki.

- *İnaltı Formation (JKi)*

In the area which is parallel with the coast is the fifth basic unit- the old İnalti formation from the Upper Jura-Lower Cretaceous period. Generally, the unit consists of carbonate platforms that are composed of beige, white, gray color, medium-thick layer, limestone. The unit is massive and dolomite. This formation is found in the neighborhoods Bahçelievler, İnağzı, İncivez, Meşruitiyet, Tepebaşı, Yayla, Yeni and Yeşil.

- *Member İnciğez (JKii)*

The Inalti formation of fragment rocks is called as a member of İnciğez. This unit is composed of conglomerate, pebbly sandstone, sandstone, siltstone and mudstone. These fragments contain carbonate, for example, gravel, grain and cement, which stand out with their red color. Fragments of conglomerate are derived entirely from the bottom of the İnaltı formation. This unit is found in the neighborhoods Birlik, Bahçelievler, Tepebaşı, Yayla.

- *Kilimli Formation (Kk)*

In the area which is parallel with the coast is the sixth basic unit- the old Kilimli formation from the Bottom Cretaceous period. The formation is composed of sandy limestone, sandstone, siltstone, claystone, argillaceous limestone and marl. The formation has three members. The first one, Velibey, consists of yellow quartz sandstone. The second one, Sapca, consists of glokoni sandstone, argillaceous limestone. The third one consists of marl. The formation is found in the neighborhoods Birlik, İnağzı and Terakki. The sandstone layers of the Kilimli Formation around the neighborhood Birlik are cracked and very steep.

- *Alluvium (Qal)*

The investigation area is characterized by alluvium sedimentary as a first cover unit. This sedimentary is located along two major rivers that discharge into the sea from the port of Zonguldak. Moreover, it is common to observe alluvium sediments in all small creeks discharging into the north of the sea and small flat areas on mountainous areas where they can encounter alluvium sedimentary. This unit is composed of coarse-grained gravel, sand and clay. Alluvium sediments are quiet tall and graded in some places whereas they are combined with slope rubbles in others. Alluvium sediments are found in the neighborhoods Asma, Birlik, Bahçelievler, Çaydamar, Çınartepe, İncivez, Karaelmas, Meşrutiyet, Mithatpaşa, On Temmuz, Tepebaşı, Terakki, Yayla, Yeni, and Yeşil.

- *Hillside Rubble (Qym)*

The investigation area is very high due to the topographical structure which has accumulated skirt cut on the hillside rubble. Generally, hillside rubble is commonly observed on the Kozlu and Alacaağzı formation skirt cut. This unit is composed of coarse and square gravel. Alluvium transition displays vertical and horizontal direction in some places. Hillside rubble is found in the neighborhoods Asma and Çınartepe.

- *Beach Sedimentations (Qp)*

The investigation area, especially the port of Zonguldak and eastern border, includes beach sediments. This unit is composed of clean slim-grained sand silts. The unit is very loose and saturated. Beach sediments are found in the neighborhoods İnağzı,

Yayla and Yeşil.

- *Filling (Qd)*

Filling material is found in the investigation area, narrow area in the north-west corner and the environs of the port of Zonguldak. Filling units are found in the neighborhoods Bahçelievler, İncivez and Terakki.

Land use helps to understand surrounding Brownfield areas and how to approach these areas within the framework of solutions. It is known that these areas have a negative influence on land use and surrounding land use conditions. Solutions for Brownfield areas need to help integration of land use between Brownfield areas and surrounding Brownfield areas (Appendix-V). The data obtained through the matrices spread over areas of 10 ha and help to determine the state of the abandoned areas and the characteristics of the whole city. As a result, all areas in the Grid Based Model gave 41 grids in the investigation for the whole area. One reason for choosing grids with this measurement is that investigation covers a wide area. The second reason is that no exactly meaningful results can be obtained through grids with higher or lower values.

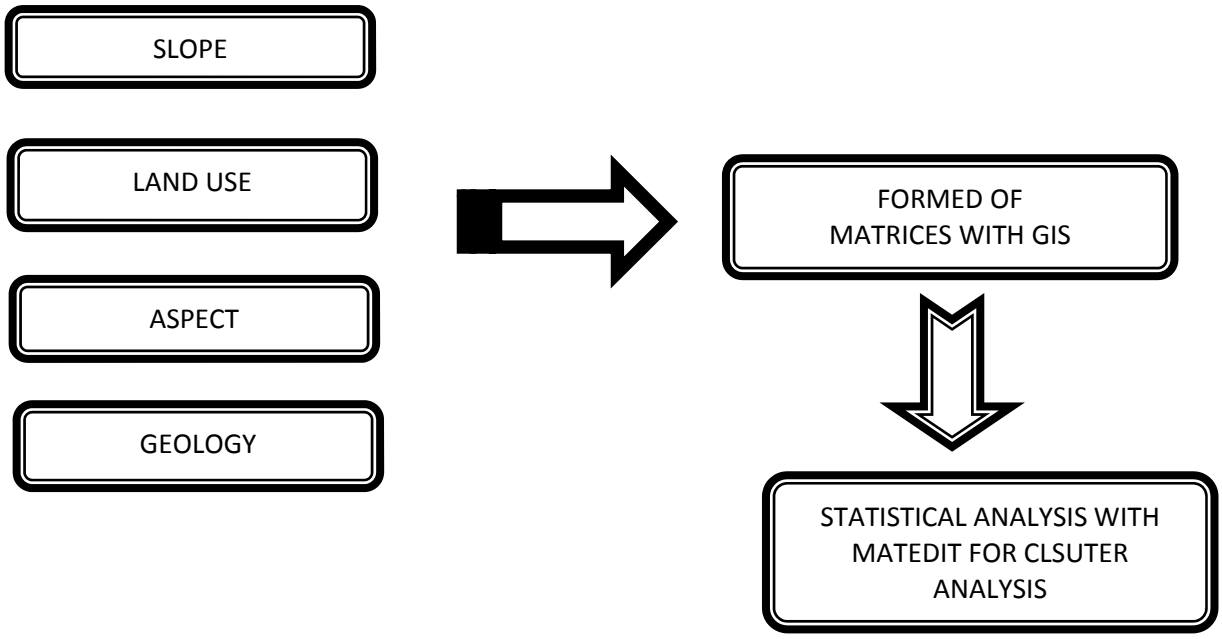
The procedures for data preparation are as follows: Attribute tables are arranged by the ArcGIS, which provides a characterization of the investigation area in terms of slope, aspect, geology and land use. Afterwards, a new attribute table is arranged through DBF file for the dataset preparation. Finally, the DBF file is opened in EXCEL and the percentage of all the areas is calculated. All the data are collected in one matrix in order for the results to be analyzed (Appendix-VI)

In this study, vector data was used for implementing the method. ArcGIS software helped to develop and to simulate our results to make predictions and characterize the investigation area. All these steps can help to develop our analysis for the current Brownfield problem areas and all other areas.

The methodology uses the creation of matrices, which could give an appropriate evaluation for the characterization of the area (Figure-4.18). A key function of the

matrix is to create a new concept of context and mission for the characterization of the investigation area.

Figure-4.18: Flow Charts of Data Analysis for the Grid Based Modeling with Cluster Analysis



Source: Mustafa ERGEN, 2009 (Author`s own construct)

The purpose of the methodological approach is mainly to enable GIS and MATEDIT to achieve a solution for Brownfield areas such as an understanding of the current situation in the research area. The data analysis in GIS and Matedit should take spatial construction and statistical analysis factors into consideration for Brownfield areas. This concept of the quantitative method is clearly explained by the present study on abandoned areas. The methodology is started with Normalization analysis in advance to eliminate redundant variables in database. Normalization is defined as *"Normalization is a process of reducing redundancies of data in a database"* (PLEW and STEPHENS, 2003). The size of the matrices helps to determine the characteristics of Brownfield areas. The Matedit implementation follows the following steps;

- Normalize all the matrices from (0, 1) by row.
- Calculate similarity; distance to column.
- Creation of the dendrogram and determination of clusters.

- Analysis of regrouping the matrix option depending on the similarity matrix for the average of ignorance elements on the diagonal.
- The similarity matrix does not give significant analysis option and does not give wide range of analysis option.
- The columns of the matrix are not regrouped depending on analysis results.
- A cluster analysis between variables and assessment.

The similarity ratio among the factors can be observed from the following table (Table-4.3). The table presents a degree of belonging, and the colored cells can suggest where each group belongs. It can be inferred from the table that the classification is a very decent one, for only 8 out of 41 outliers were evident.

Table-4.3: Variables Similarity Ratio

Group on Column matrix "DIST"	1 <= Group	2 <= Group	3 <= Group	4 <= Group	5 <= Group
1	4,21776482	4,009437848	2,544362677	1,272962469	2,757201161
2	1,783421727	3,527692488	1,962096359	2,726034895	3,433440606
3	0,962815054	1,865776865	1,231074219	2,548447938	1,8627086
4	2,759111987	6,564242894	3,204291043	0,841968313	2,738053766
5	3,462004879	7,903863971	3,523606673	1,470917241	3,459950002
6	1,744952276	3,82286041	1,931476239	2,369405783	4,782763245
7	1,136451876	2,307113628	1,575192279	2,364992868	2,092548796
8	3,029050418	6,277620924	4,032051366	0,761810571	2,463912078
9	3,725602531	7,16123215	3,169584049	1,598136349	3,957511699
10	1,543841811	2,84875053	1,78752014	2,727603279	3,692740465
11	0,836250349	1,887200031	1,251048457	2,647254481	2,840543867
12	1,351026842	2,638112167	1,734284422	2,420471558	2,761777702
13	3,008784472	4,428935256	5,516636502	0,861306252	2,090227762
14	3,252810205	4,740110609	4,136946742	1,779683874	4,968363745
15	1,691504506	2,570235122	1,85222403	1,956188876	4,491556779

16	1,854362032	4,761544555	2,116527174	1,842278575	4,862284674
17	1,980795765	3,924420183	2,361464182	2,306746272	5,115226071
18	1,85786839	3,523959204	2,221106053	1,542973075	4,395553664
19	2,496636146	3,823869372	4,662366054	1,300631804	2,481581616
20	4,556469476	5,456944595	5,643211939	1,215721713	3,422316958
21	2,330396267	4,065692027	2,281431315	1,621279629	4,12189431
22	3,018506209	6,61998256	3,952087851	1,577979245	4,19339225
23	2,69344385	5,850846853	2,960918299	2,020261633	4,430563452
24	1,764324261	3,658477952	2,175182146	2,027389637	4,730361248
25	3,19712925	4,782828067	5,415402048	1,105154252	2,257417859
26	3,39201925	5,694050412	5,070188812	1,615895305	3,115150482
27	2,782160842	4,011542939	3,237436723	1,237814316	4,009717395
28	3,226783564	7,312463233	4,000130956	1,749280122	4,249381951
29	3,10946899	5,369519037	2,986618461	1,436883204	2,845156005
30	2,367346862	4,031974516	4,892299377	1,342671896	3,262989395
31	3,546325722	4,953618631	5,289129412	1,48848412	3,821970509
32	5,255796277	4,981746187	3,797692296	1,040833271	2,885313803
33	5,005976256	4,902457993	4,251405773	1,114074689	2,569801968
34	5,121742505	4,778104021	3,701076919	1,35460821	3,115506235
35	2,795258934	4,124389604	4,773660881	0,611350534	1,862140021
36	4,63721263	4,245363536	3,709768212	0,908280374	2,410691005
37	4,751237102	4,417022283	3,012710677	0,990327801	2,871211196
38	3,389617713	6,816245719	3,308679577	1,065260553	2,503967529
39	5,028065135	6,012494077	4,342953558	0,932720845	2,649449176
40	2,638492045	6,881300698	2,91346947	1,409945687	2,341500104
41	2,294543761	5,813336555	3,245172708	1,142202793	1,895454165

Source: Mustafa ERGEN, 2009, (Author`s own construct)

According to the table, there is a high belonging for cluster groups and there are specific and exact grid ID's. Nevertheless, this is not the case for the fourth group, for it is not dominant and has two outliers which are in overall assessment. On the other hand, the first, second and third groups have many outliers which are related to each other. In this case, the analysis suggests that these three groups have strong relations with each other.

A look at the probability matrix table reveals that the first and second groups are very close to each other and, according to the results of the similarity analysis, this is the case for the third group (Table-4.4). The fourth group is totally different from and has no relation with the other groups. This shows that the analysis is based on a proper evaluation. The fifth group has a high similarity with the first, second and third groups,. Even so, it is slightly different from the other groups.

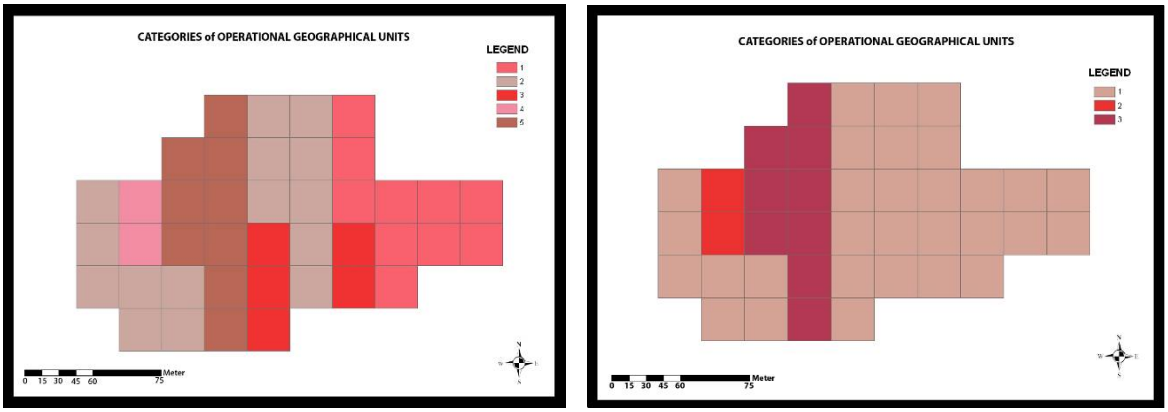
Table-4.4: Probability Matrix

Probability matrix	1	2	3	4	5
1	0	0,0029	0	0,9977	0,1731
2	0,0029	0	0	1	0,2253
3	0	0	0	1	0,0474
4	0,9977	1	1	0	1
5	0,1731	0,2253	0,0474	1	0

Source: Mustafa ERGEN, 2009, (Author`s own construct)

This result can be presented in the maps below as a regrouping of all the groups, which helps to analyze the whole area. The first map shows our current analysis groups for the cluster analysis. The second one explains the probability matrix table and which group can possibly be close to each other and has strong relation between each other.

Figure-4.19: Categories of Operational Geographical Units



Source: Mustafa ERGEN, 2009, (Author`s own construct)

The first map presents the grouping of the grids depending on the similarity ratios. On the other hand, the second map presents the regrouping (1^{st}, 2^{nd}, 3^{rd}) of to the grids depending on the similarity between each other. Data analysis can be done with grids depending on the similarity ratios or regrouping of the grids data. But regrouping data didn`t give significant results for the method application. That is why cluster description matrix is prepared by the grouping of the grids depending on the similarity ratios. 5 groups are used for data analysis in the Brownfield areas.

Table-4.5: Cluster Description Matrix

Cluster Description	1 <= Group	2 <= Group	3 <= Group	4 <= Group	5 <= Group
%0-15	3,54194961	1,84997793	0,88524216	1,63820148	0,997530395
%15-30	4,02476063	2,25865047	0,51799299	0,89243526	0,355408362
>%30	2,53732204	2,53446607	0,40003043	0,45948264	0,267301919
4	3,61010985	2,8406486	0,87146356	1,3676428	0,77850051
7	3,71689058	2,40330139	0,67977963	1,43675392	0,764898775
8	3,44611167	2,3255816	0,62721338	0,8494616	0,376802779
CKO	2,17584846	1,54391804	0,531723	0,25152672	0,199789204
CKA	2,01531915	1,50482476	0,2297618	0,65375136	0,323637974
KK	0,33688613	0,11725342	0,0089639	0,12401206	0,096104216
CA	1,52002285	1,78807355	0,4576605	0,41703545	0,272926968

QAL	2,85406925	1,16615047	0,89533756	1,60481864	1,40203696
JKII	0,62384488	0,26187789	0,1172145	1,24423109	0,535898221
JKI	2,12998689	0,56678843	0,40023241	1,50953697	0,825699697
QYM	0,44406142	0,61511366	0,21516373	0,07448462	0,060040313
DCY	0,51789084	0,89849008	0,10590724	0,01477986	0,220598274
QD	0,21343124	0,0698558	0,0418326	0,17908928	0,468032552
QP	0,51833887	0,1439494	0,2621913	0,51748335	0,028506746
School Areas	2,07055309	0,52506787	1,05865938	1,91393455	2,321645706
Garden	3,70716851	2,05069089	1,03811534	2,09149706	0,791229511
Military Areas	0,64455254	0,13460702	0,13558002	0,81198635	0,713675374
Free areas	0,55478436	0,20257051	0,11748618	0,56447483	0,941635116
Governmental Areas	1,55220297	0,6928469	1,03288504	1,40661056	1,780913904
Copse	3,25044116	2,46451296	0,28781715	0,385759	0,116992553
Religious Areas	3,09589986	0,98729773	1,13005968	1,51595866	1,38761979
Park Areas	1,04608426	0,32234517	0,49887243	1,56691015	2,024777094
Health Facilities Areas	1,08804666	0,36790556	0,17496186	0,97371833	0,48980364
Trade Areas	1,18600248	0,25950614	0,57390037	1,28390843	2,193284291
Cemetery Areas	2,0739313	0,80511337	0,66501958	0,33363643	0,094957824
TTK Areas	1,79444816	0,62058169	1,11550991	0,82718899	1,232403919
TCDD Areas	0,7104999	0,19988312	0,86119198	0,50506643	0,205855243
Cultural Activities Areas	0,56693511	0,09295107	0,47868598	0,8748713	2,183850654
Sport Areas	0,40805601	0,11949154	0,16214151	1,59376281	0,014357621
Manufacture Areas	1,20452756	0,62517013	0,94178713	0,44500961	0,210517569
Storage Areas for Coal Mining	1,09200685	0,59632034	0,26562512	0,085044	0,014980811
Harbor Areas	0,56100785	0,23579064	0,297081	0,91362956	1,296034442
Social Areas	0,53501068	0,13040238	0,20323431	1,75325446	0,16855762

Coal Washing Areas	0,49257798	0,06663125	0,16938887	0,41132765	1,068488362
University Areas	0,48675235	0,12941428	0,07232676	0,8444022	0,458333063
Houses	3,48903604	1,64114725	1,03729709	2,1905093	0,917336526
Abandoned Houses	1,36773108	0,50466805	0,35951759	0,54738753	0,521949113

Source: Mustafa ERGEN, 2009, (Author`s own construct)

Cluster Description Matrix defines five characteristics of the cluster. They provide detailed information about not only the abandoned areas but also all the areas in the city.

Cluster 1:

Slope: From 0 and more than 30% all slope areas can be determined in this cluster

Aspect: North (East-West), South (East-West), East and West part of Aspect can be defined in the Cluster 1

Geology: Kozlu Formation (Cko), Karadon Formation (Cka), Kilimli Formation (Kk), Alluvium (Qal), Member İnciğez (JKii), İnaltı Formation (JKi), Beach Sedimentations (Qp)

Land Use: Areas of School, Gardens, Copse, Areas of Religious, Areas of Health Facilities, Areas of Cemetery, Areas of TTK, Sport Areas, Manufacture Areas, Storages Areas for Coal Mining, Houses, Abandoned Houses

Cluster 2:

Geology: Formation of Alacaağzı (Ca), Yılanlı Formation (DCy), Filling (Qd), Slope Rubble (Qym)

Cluster 3:

Land Use: Areas of TCDD

Cluster 4:

Land Use: Areas of Military, Free Areas, Social Areas, University Areas

Cluster 5:

Land Use: Governmental Areas, Areas of Parks, Areas of Trade, Areas of Cultural Activities, Harbor Areas, Coal Washing Areas

An overview of the assessment suggests that the clusters 1 and 5 are more important than the others in that these clusters include more Brownfield areas in the city. The following section makes an attempt to examine problems of Brownfield areas, potential Brownfield areas and surrounding Brownfield areas in the study.

4.3. Defining Zonguldak's Urban Regeneration Areas and the Decision Model of the Brownfield Design

The TTK is basically the largest economic portion of Zonguldak, which is gradually reducing the number of its workers. For that reason, Zonguldak cannot maintain its employment conditions. The city has limited resources and employment opportunities. It does not enjoy favorable conditions for agriculture structure, industrial development and has not got appropriate spaces and development structures for future development. The city needs radical investment decisions through government policies in order to create new job opportunities.

From this economic view, the city suffers from former coal mining areas, and abandoned houses as Brownfield areas. This situation creates negative interaction between the land uses in the city and Brownfield areas.

This process of city development necessarily changes the growth system, leads to the decline of the social and economic life, and has a negative impact on nearby land use structure (Figure-4.20). Urban regeneration is a common solution for ecological, economic, and social reconstruction. Even so, an appropriate solution for Brownfield redevelopment should provide a spatial analysis along with ecological, economic, social analyses.

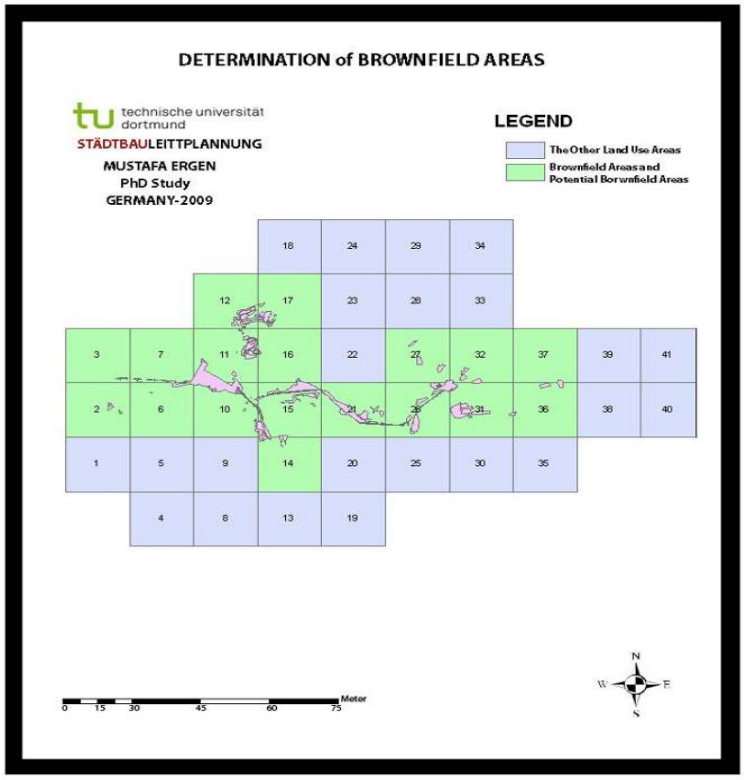
Figure-4.20: Current Brownfield Areas in Zonguldak City

Source: Mustafa ERGEN, 2009, (Author`s own images)

Identification of Brownfield areas and future potential Brownfield areas is essential in city development in order to understand the problem. When the TTK decided to downsize its structure and employment rate, some of the areas turned into Brownfield areas. Moreover, Zonguldak is not ready to integrate these areas into city development, which results in both social decline and economic decline in the city.

Our purpose is to test quantitative and qualitative methods as a new kind of methodology on derelict areas. The quantitative method enables one to analyze the prevalent details in derelict areas. The Grid Based Model can help to determine the characteristics of Brownfield areas. Brownfield areas and potential Brownfield areas are found in the TTK areas. Some of the TTK areas are already abandoned because of economic decline (Figure-4.21).

Figure-4.21: Determination of Brownfield Areas



Source: Mustafa ERGEN, 2009, (Author`s own construct)

These core areas can be defined as Brownfield areas in the city center. It is essential to regenerate these areas to make them habitable and to help integrate sustainable approaches into the city for future development. The analysis suggested that the TTK areas have generally a slope of 0-30%, and have North, Northeastern, and Northwestern aspect. JKI, CA, CKO and CKA are the Geological structures for the Brownfield areas. The dominant land use structures in the Brownfield areas and Potential Brownfield areas are as follows; Garden Areas, Free Areas, Harbor, Storage Areas for Coal Washing and Copse.

Figure-4.22: Old Coal Washing Area in Zongudak

Source: Mustafa ERGEN, 2007, (Author`s own image)

From overall assessment, Storage Areas for Coal Washing is currently one of the important Brownfield areas in the city center (Figure-4.22). Obviously, this area will not be the only one in Zonguldak. These areas are also negatively affected by other types of land use.

The Coal Washing Area and surrounding areas have a slope factor of %0-15. Geology is CKO, CKA and CA. Aspect factor are North, Northeastern and Northwestern. Land use is comprised of Housing, Garden, Copse and Trade Areas. The area has favorable slope conditions, but it does not get much sun shine. The geology is not useful for more housing or trading center depending on the alluvial character.

Decision Model of the Brownfield Design for the Coal Washing Area

Turkish law number 3194 defines an active green area of 10 m^2 for per person in cities. This figure is 2 187 220 m^2 according to the population of the city center for Zonguldak. Each grid needs an active green area of 53 346, 8292682927 m^2, as it is known that one grid has 1000000 m^2 areas. The process can be formulated as follows;

Population of Area*Recreational (Open Green Space) Areas for per person/Number of Grid

2187220*10= 2 187 220/41=53 346, 8292682927 m^2

Grids are also used for determining the state of land uses, green areas and settlements. In our specific grid for the Coal Washing Area in grid 10, the amount of green areas for active and passive areas is as follows;

Active Green Areas (Parks) [0, 62] 0, 62*1000000/100=6200 m^2
Passive Green Areas (Garden + Cemetery + Copse) [38, 31 + 0, 00 + 14, 09= 52, 4]
52,4*1000000/100=524000 m^2

An overview of the green areas suggests that the amount is obviously more than enough for people with passive and active green areas. In reality, however, it is known that passive green areas are not useful for people. Therefore, they cannot be regarded as useful green areas. In this sense, passive green areas are not enough to supply recreational opportunities for the people in this specific grid. As a result, the Brownfield (59000 m^2 in the grid amount of Brownfield areas) design should be provided with recreational opportunities by approaches to solutions. The grid analysis with cluster analysis presented similar characteristics all around Zonguldak. The model concludes that design approaches should take recreational opportunities into consideration for Brownfield areas.

The method used in this study requires Urban Planning and Landscape Architecture implementations. The reason is that places for the required active urban green areas are chosen depending on the ratio of population and analysis methods in urban planning. On the other hand, landscape architecture employs different analyses and models for active urban green areas. In these implementations, different analyses and models are used for a city depending on professions. This is not enough to make decisions on urban regeneration and revitalization. Old industrial areas are located in the city center, which presents some principles for sustainable implementations;

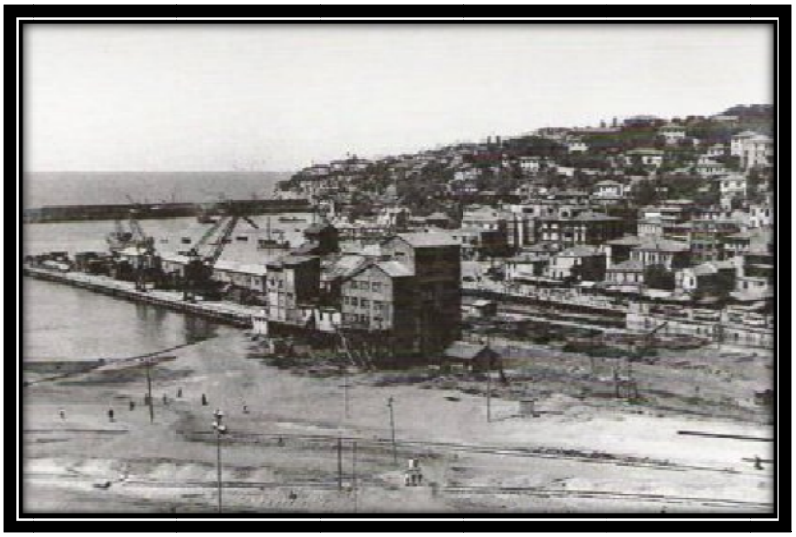
- Through functional use, recreational and green areas should be created in those abandoned areas which are almost inhabitable.

- Necessary functions will be provided for abandoned areas trough urban development. Solutions will be provided for deficiency in urban development and problems with integration into the urban structure.

These principles must help achieve sustainability in urban regeneration and raise life standards in abandoned areas. The analysis provides more accurate and sustainable solutions when compared with classical approaches to Brownfield areas. The model gives priority to green structures in the design of derelict areas. Recreational arrangement can provide an option for public demands and healthy city development in derelict areas.

Various analysis techniques aim to achieve sustainable and healthy development for cities. Urbanization process can be defined by an increase in population in urban areas. Especially, coal mining areas is likely to develop as metropolitan cities continue to expand over the mined out areas (BAUER, 2006). *"When mines open in isolated regions they need to provide housing and other necessities to their employees"* (BOYD, 2010). This development causes unhealthy development in mining cities. The example of Zonguldak is one of the cities that can be identified as a typical coal mining city (Figure-4.23).

Figure-4.23: View of Coal Washing Area Development in the City Center



Source: [51]

The legacy of coal mining areas adjacent to the city center of Zonguldak present just such a complex land use challenge, because of decreasing coal production and

decreased number of laborers (WORRALL et al., 2004). One of these areas is the coal washing area in Zonguldak. These coal mining structures are helped to have a new urbanization development (Figure-4.24).

In a very general way, the major urban regeneration projects can be linked with solutions for derelict areas and solution pathways of the future (PLÖGER, 2007). Urban regeneration examines sustainable and healthy development frameworks within which principles of urban regeneration must be turned into practical planning action (ROGER, 2005). The general approach to urban regeneration and technical methodology provides a detailed analysis and supports development of derelict areas.

One of the current problems in many developing countries is the rapid rate of de-industrialization. In this process, wide disparities among urban areas remain in terms of economic conditions, access to infrastructure and services, opportunities socio-economic mobility and control over natural resources and local development [60]. It is the reason that people start to migrate to other places at a very rapid pace, because of increased de-industrialization. Most places in developing countries have not succeeded in finding an appropriate solution for their derelict areas. In an effort to provide regeneration, many derelict areas encourage the new development option in post-industrial cities. Unfortunately, this post-industrial development is often highly dependent on economic opportunities and often makes problems of unemployment worse.

Urban regeneration can be defined as replacing functionality of the derelict areas and finding sustainable ways of analyzing social, ecological and economic factors. The purpose of re-gaining derelict areas is to integrate them into city development through with appropriate solutions. Urban regeneration projects are a priority for the coal washing area in Zonguldak, which helps to test the new methodological approach used in this study. The model of this study provides healthy and sustainable urbanization for abandoned areas. The purpose of this study is only to emphasize on an appropriate solution for regaining abandoned areas from macro scale to micro scale.

Figure-4.24: View of Coal Washing Area After Tearing Down of the Coal Washing Area






Source: Mustafa ERGEN,2007, (Author`s own images)

4.4. Conclusion

The results of the analysis indicate that there is a potential solution for increasing abandonment problem in city development. The decision Model on Brownfield areas helps to analyze design solutions in a sustainable way for Brownfield areas. The qualitative analysis shows that Zonguldak not only needs to transform its Brownfield areas, but also more planning and design approaches. The methodological analysis suggests some new planning approaches as a general outline for city development. These new planning approaches can be defined as follows;

- Increasing property problems that cover governmental areas,
- The changes in the city needs other approaches to functions,
- Land structure is composed of slopes, which poses a problem for planning and development,
- The problem in Zonguldak is not considered together with its physical, social, legal and economic features in solutions and solution implementations.
- Zonguldak has a strategically important profile in the region because of its location, identity and socio-economic structure. Zonguldak has been affected by the acceleration of urbanization since the 1950's, which has resulted in migration in parallel with Turkey's social and economic structure.
- Certain practices within the framework of the city development in Zonguldak lead to compression and concentration in certain areas, which results in unhealthy and irregular urban structure within squatter house areas. Currently, the city primarily needs to define its current and near future problems to adopt the right kind of solutions;
- The study inevitably addressed the property problems (ANONYMOUS, 2006). In the city, the state enjoys 80% of the land such as municipality, the TTK, forests, etc... (ANONYMOUS, 2006). This plays a negative role in city development (ANONYMOUS, 2006).
- Zonguldak is different in natural structure, ownership structure, features and groundwater resources (ANONYMOUS, 2006). Although the city has had rapid change and development with population increase, it has limitations (areas of forest, sea, unfavorable geological areas, excessive slope, etc...)

(ANONYMOUS, 2006). Furthermore, the city development is concentrated and compressed in certain areas due to the property problems (ANONYMOUS, 2006). It was formed by a continuous pressure that resulted in a crowded city structure in Zonguldak (ANONYMOUS, 2006).

- Zonguldak does not have too many flat terrains for the suitable development, because of its topographical conditions (ANONYMOUS, 2006). A large part of the city is located in areas with a slope of 30-40% which resulted in irregular development in the city (ANONYMOUS, 2006).
- From an economic perspective, the TTK decided to decrease the number of its employees and shut down some parts of its areas, which created Brownfield areas in the city center and the whole city. This has had a negative impact on the appearance of the city and its economic conditions.

Understanding abandoned problems and redevelopment options can help to reveal a new dimension and can bring new dynamics to the city. The strategies given above prove that Zonguldak needs a new development option to survive in the current economic trends. Abandoned areas lead us to the conclusion that new development options could help the city. The present study emphasizes that it is necessary to have a new scientific approach through quantitative and qualitative analyses.

The problem of Brownfield areas is very common in developed countries. Regeneration solutions guide undeveloped countries or any other countries in which there are shrinking conditions as a new problem in city development. There has been a lively debate on the issue of shrinking in the scientific community. This study has presented a new and appropriate solution for Brownfield areas. Sustainability of Brownfield areas is based on the principles of economic, ecological and social components. The present study has also put emphasis on derelict areas with these components. It presents a detailed analysis of the derelict areas in Zonguldak through quantitative and qualitative methods.

As a result, the study presents an understanding of the characteristics of the Brownfield areas in Zonguldak within theoretical and empirical approaches. Currently, one of the Brownfield areas is observed near the port that used to be an old Coal Washing area. This area has a negative impact on the city structure which

requires a solution for regaining the city development. The new model is implemented to find an accurate solution for the problem. The next step is going to explain that Turkish cities will determine development options for near future in an economic context and create a new planning system for their Brownfield areas.

5-RECOMMENDATION STRATEGIES FOR TURKISH CITY DEVELOPMENT IN AN URBAN REGENERATION CONTEXT and DEVELOPING AN ACTION MODEL FOR URBAN REGENERATION

The current approaches to urban regeneration target economic and cultural redevelopment, social cohesion as well as physical rehabilitation and physical aspect [20]. Population and job loss are the main indicators of the transformational change in the spatial structure for cities in the globalization process. Actual development of Zonguldak suffers from economic decline and transformational change of spatial pattern in the old coal mining sites. This means that it is necessary to have a new spatial construction of consideration into the abandoned sites in Zonguldak.

Shrinking cities present a great variety of problems for urban development and have a drastic effect on economic conditions in cities. According to Jones and Wild (1991), cities have problems with social and economic capital, old infrastructure, environment, and image associated with deindustrialization in old industrial regions (IŞIN, 2009). The Turkish urban planning system must also provide a solution for the shrinking problem in the globalization process. It might be possible to develop new planning approaches and systems, which address urban shrinkage and the major environment and resources issues for Turkish cities (WATSON, 2009).

5.1. Assessment of Brownfield Effects on Nearby Cities

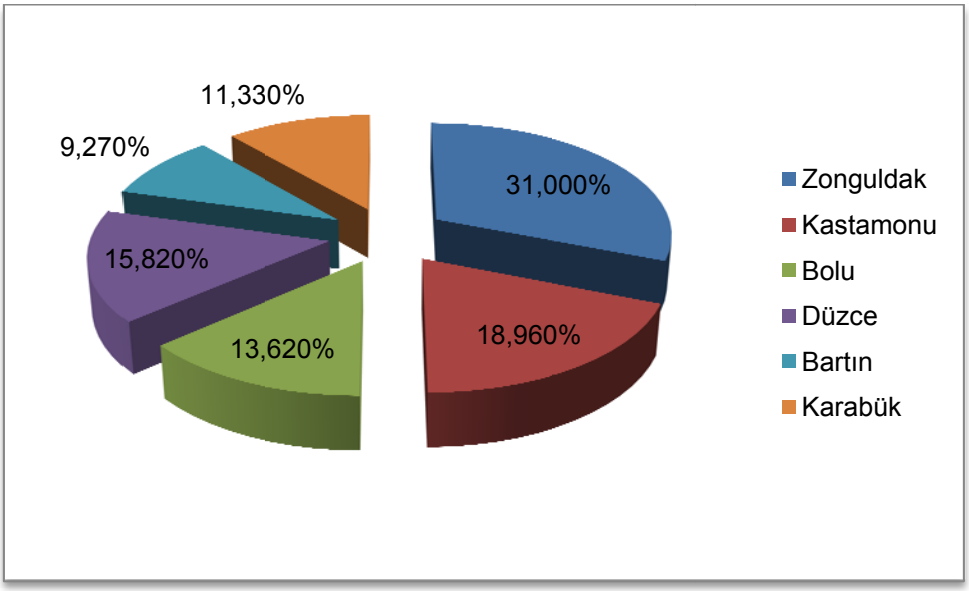
The change in Zonguldak's economy towards globalization has significant effects on the city and region. This transition in the economy influences the spatial structure of Zonguldak to a great extent (MAIDE and JAKAB, 2007). Several Brownfield sties in Zonguldak are largely located in the city centre and ongoing development has significant effects on the region.

The provinces Bartın and Karabük were separated from Zonguldak in 1991 and 1995 respectively. Even so, these cities have still strong economic ties with coal mining production in Zonguldak. Karabük Steel Plant was established in 1937 (ERTUNA, 1998). It is an integrated steel plant using domestic ore and coal in its production (ERTUNA, 1998). It is obvious that there is a strong evidence of interrelation between Karabük and Zonguldak. Shrinkage in Zonguldak's economic development results in

drastically negative effects also on Bartın in this process.

Thanks to its economic state, Zonguldak is the one of the most important cities in the region and, according to the Census held in 2000, its population is 615 725. The population of Zonguldak (% 31) indicates how important the city is in the Black Sea region of western Turkey (Figure-5.1). The population of Zonguldak has been increasing since the foundation of the Republic in Turkey and Zonguldak urbanization has been associated with the rapid development ever since.

Figure-5.1: Western Black Sea Region Population Rate Depends on the City



Source: ANONYMOUS, 2002

However, closures, massive lay-offs of labor, and early retirement policies remain characteristics to urban economic decline while decreasing population growth rates and increasing out migration rates have indicated urban depopulation in Zonguldak (IŞIN, 2009). The main reason behind population decline in Zonguldak is that the downsizing of TTK decreased the number of coal employees and there have not been any other job opportunities in the city development (IŞIN, 2009).

The first census was carried out in 1927 (TASTI and DEMIRCI). According to the census (1927), the proportion of the population of Zonguldak to the total population in Turkey is 1, 96%. This proportion was highest with 2, 13% in the census of 1980. The census of 2000 showed that the proportion was reduced to 0, 97% (Table-5.1). The

data on the level of population between 1927 and 2000 suggests that there was a sharp decline in population.

Table-5.1: Zonguldak city Population Rate Depends on Turkey

YEARS	POPULATION		POPULATION RATE DEPENDS ON TURKEY (%)
	ZONGULDAK	TURKEY	
1927	267965	13648270	1.96
1935	322108	16158018	1.99
1940	349783	17820950	1.96
1945	383481	18790174	2.04
1950	426684	20947188	2.04
1955	491147	24064763	2.04
1960	569059	27754820	2.05
1965	650191	31391421	2.07
1970	743654	35605176	2.09
1975	836156	40347719	2.07
1980	954512	44736957	2.13
1985	1044945	50664458	2.06
1990	1073560	56473035	1.90
2000	615599	67844903	0.91

Source: ANONYMOUS, 2002

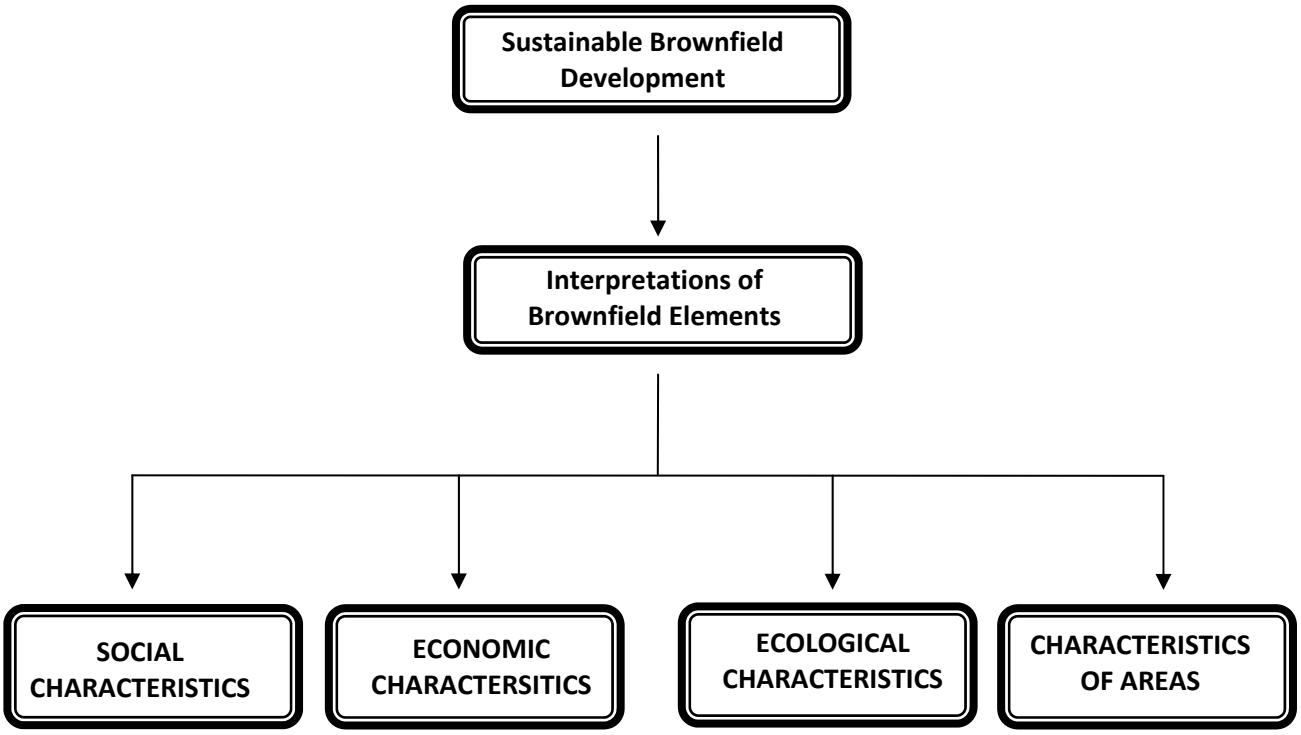
Zonguldak has changed in terms of administrative boundaries ever since the separation of Bartın and Karabük from the city. Although Zonguldak is the most crowded city in the region, it has serious problems with losing population in the current globalization process. Currently, the recovery and improvement of abandoned or obsolete areas, such as old mining areas, infrastructures and out of use installations, is a key issue in Zonguldak (GIOVANNI, 2009). It should be noted that the shrinking problem has radical effects on Zonguldak and western Black Sea region development.

5.2. Action Strategies at Urbanization Level

Urban Brownfield redevelopment has recently emerged as both major economic development and environmental priority in developed countries (BARTSCH et al., 1991; U.S. CONFERENCE of MAYORS, 1998; MEYER, 1998). Currently, Zonguldak city in Turkey confronts with the challenge of economic decline and population loss in former coalfield sites. Urban regeneration in these sites must focus on an analysis of economic, ecological and social factors for sustainable development. The purpose of this part of the study is to identify developing component of a framework that links abandoned sites with redevelopment initiatives in ways that lead to the improved and sustained economic, social and ecological viability in Turkish cities (PRIBLE, BAKER and DANIELS et al., 2005).

Urban regeneration and Brownfield reuse improve local land economies and aid sustainable land use (JACKSON, 2010). Additionally, urban regeneration and Brownfield reuse are also the crucial tools of descriptive and explanatory research methods. This study is based on the key concept of sustainability in abandoned areas. Data analysis can help to create new innovative solutions associated with abandoned sites and sustainable development. The fundamental development of sustainability in Brownfield sites has basic elements into the methodological implementations (Figure-5.2). These basic elements can be formulated within factors of ecological, economic, and social, characteristics of areas for appropriate solutions for Brownfield sites.

Figure-5.2: Fundamental Approach to Sustainable Redevelopment Brownfield



Source: Adapted from [4]

A fundamental concept of the planning process is that primary parameters of sustainable development-the characteristics of areas, social, ecological, and economic system of a community- are crucial components (SCGPN, 1996; RAPPORT, 1997; [4]). This approach to urban regeneration emphasizing the environmental and economic spheres of regeneration is replaced by a more integrated approach to urban redevelopment which links the stimulation of economic activities and environmental improvements with social, cultural, and characteristics of areas elements (CALANTONIA et al., 2009).

The implementation guide for new urban regeneration strategy can give specific guidance on what should be included at all levels of the Brownfield redevelopment. This guide is expected to create a new approach to the shrinking problem in Turkish cities. The basic approach to Brownfield redevelopment includes a description of particular elements of the solution. It starts with the description of diagnosed problems connected to undertaken research on Brownfield redevelopment issues (TÖLLE et al., 2009).

According to Göksu (2003), regeneration areas can generally consider the following strategies for sustainable achievement;

- Different approaches and strategies need to be developed because different regions have different problems,
- Each project helps to improve the future vision of the city,
- Determination of each proposal solution has importance cooperation among local government, investors and public intervention in an organized way.

The purpose of these strategies is to provide solution to assist and guide communities, and municipalities in the planning and implementation of sustainable Brownfield development [4]. The results of this study will assist Turkish cities in evaluating various approaches being taken by Brownfield redevelopment in order to refine or develop new methodological approaches [4].

Urban areas suffer from several constraints of abandoned areas, which lead to the shrinking problem in terms of economic and population condition. The abandoned facility becomes a constantly problematic area and can spawn blight in adjoining areas (BARTSCH, 2003). Many Brownfield sites are caught in a vicious cycle of decline, which only exacerbates the problem in city development (BARTSCH, 2003).

Brownfield sites of Zonguldak require the kind of development strategies associated with urbanization process. The strategies used by Zonguldak to deal with abandoned sites mainly focus on using sustainability component of urban planning instruments (GRIMSKI and FERBER, 2001). In particular, action strategies focus on urban development that is likely to regain abandoned areas and to sustain the city development in Zonguldak. These strategies are determined and scaled as follows:

- Enhancement of community access to the Brownfield area,
- Maximal improved usability of the Brownfield area and using for recreation, nature experience,
- Renewal of the memory of the place (industry, green areas, landscape and people),
- Improve sustainability of the environment for urban areas,

- Improve sustainability in a quality of life for urban areas,
- Develop approach for sustainable regeneration of urban derelict area and Brownfield in Europe cities,
- Provide a sustainable city and sustainable urban development in Zonguldak,
- Provide sustainable lands re-use in urban areas.

The assessment, remediation and redevelopment of Brownfield sites have numerous benefits to the urbanization process (WHITNEY, 2010). The result of the study indicates that action strategies offer an important contribution and guidance to the implementation of urban regeneration in Zonguldak (WHITNEY, 2010).

5.3. Developing an (Conceptual Framework) Action Model for the Implementation of Regeneration Projects

Despite the fact that Zonguldak is declining very slowly, former coalfield sites suffer from decline related to economic corruption and population loss. The Regeneration Framework is based upon a comprehensive understanding of where Zonguldak has come from and, from outputs of the shrinking problem solution, how it should be arranged [61]. The main purpose is to act as a catalyst for regeneration in the sense that it can attract other resources from private, public and voluntary sectors in order to bring about improvements in abandoned areas (POTTS, 2008).

The Process of Conceptual Framework Development on Brownfield Sites for Turkish Cities

This section focuses on the research question two: “How can Brownfield areas be integrated with to city development?”. Within the conceptual framework of Turkish cities, the shrinking problem can be defined, in simple terms, as either economic collapse or population decline. The conceptual model outlines the principal approaches in this study and identifies entry points for macro and micro scale approach into the solution [62]. In this study, a qualitative method and a quantitative method are used for the identification of macro scale analysis (regarding the social, ecological and economic factors) and for the identification of micro scale analysis (regarding the characteristics of Brownfield sites) respectively. The method should be

to build on the progress and success to develop abandoned areas [63]. Urban regeneration ideas and strategies can help to overcome the shrinking problem in city development. Each level of the conceptual framework approach involves utilizing Brownfield sites for Turkish cities.

The conceptual framework gives rise to an overarching project concern about potential planning approaches and construction schemes [64]. The approach of conceptual framework offers cities a way to redevelop and revitalize their abandoned areas in urban regeneration projects (JOHNSON and TASHMAN, 2002). Urban regeneration projects contribute to sustainable development through recycling of derelict land and buildings, and facilitating the development of sustainability in cities (CHOUCH, DENNEMANN, 2000).

Elements of the conceptual framework are the most conducive to progress in Brownfield redevelopment and urban planning practice for Turkish cities (HEROIU-IONESCU, 2010). The outcome of the shrinking cities is a profound effect of the territory, which makes sense of the globalization impact on urban fabric (MAGATTI and MARTINELLI, 2011). The fundamental approach of conceptual model has three components of sustainable development (economic, social and ecological components) and enables one to analyze the characteristics of areas (Figure-5.3). The conceptual model for Brownfield sites emphasizes that all of the elements can facilitate the efficient identification of best practice approaches and research gaps (FERBER et al., 2006).

Figure-5.3: A Conceptual Model of Urban Regeneration for Turkish Cities
(Illustrative interaction Matrix for the Urban Land System)

Environmental	**Health Protection**	**Attract Tourists**	**Prevent Contamination**
Provided habitat in Parks	**Social**	**Provide a Market**	**Analysis of Land Opportunities**
Fund Habitat Conversation	**Provide Jobs**	**Economic**	**Provide Revenue**
Provide Effective Use of Land Resources	**Design of People Necessities**	**Defined of Appropriate Development Options**	**Characteristics of Brownfield Areas**

Source: Adapted from FERBER et al., 2006

According to Ferber et al. (2006), the interaction matrix can be used to study the relative instructiveness, dominance and dependence of the parameters. Ferber et al. (2006) described interaction matrix as follows:

> *"The sum along a row is a measure of the influence of a parameter on other parameters (cause). The sum down a column is a measure of the dependence of one parameter on the others in the system (effect). A plot of cause against effect allows dominant parameters (plotting below the 45° line) to be differentiated from dependent parameters (plotting above the 45° line). The farther from the origin a parameter plots, the more interactive it is; the more influences or is influenced by the rest of system. The overall system performance is summarized by the mean cause and mean effect point, Pbar, that lies on the 45° line (mean cause=mean effect; FERBER et al, 2006)"*

The urban regeneration approach focuses on solving problem in order to provide sustainability with this systematic approach. Brownfield sites are an important component for the conceptual model for developing sustainable approaches in the

cities (BOOTT et al., 2000). Sustainable development provides incorporation among economic, social, environmental and characteristics of areas needs (BOTT et al., 2000).

5.4. Summary and Overview

Methodologically, the analysis in this study reveals a new scientific approach to Brownfield sites. With the case study in Zonguldak, this study tests and seeks an answer to the research questions presented by the hypothesis. A combination of qualitative method (SWOT) and quantitative method (Grid Model with Cluster Analysis) were used in order to find an appropriate solution for Brownfield sites. The lack of macro and micro scale analyses are one of the obstacles to understanding the shrinking problem as a whole. The methodology of encouraging abandoned sites redevelopment provides a complete analysis through a qualitative and quantitative approach from macro scale to micro scale.

The first priority of the methodology is one of major concerns of a new scientific approach and an analysis of the gap between macro scale and micro scale in Brownfield issue. This methodology is an opportunity to bring together best practices and various tools that are developed to create the best opportunities for an integrated approach for future development of Brownfield sites (ERTEL et al., 2007). It is concluded that this methodology in Turkish cities can provide an appropriate solution for the Brownfield redevelopment approach.

Adaptability within Brownfield redevelopment should be provided by planning for longer term development potential with identifying solution approach [65]. The theoretical analysis of the study is the focus on how to handle negative urban development (LAURSEN, 2008). The methodology includes an analysis of both macro scale, and micro scale in order to understand the problem in either way. The design decision model and conceptual model are finalized as a new systematic approach to a more accurate and appropriate solution in Brownfield sites. The study concludes with an obvious approach to defining several strategies for Zonguldak and other Turkish cities;

- Sustainability refers to economic and social need as well as the ecology and characteristics of areas issues.
- Achieving sustainability emphasizes new structures and approaches in regeneration project.
- Shrinking cities can provide new dynamics and approaches in order to survive in the globalization process.
- Shrinking problem can provide an opportunity to transform the structure of cities structures into a global view.
- The shrinking problem provides new opportunities for development in abandoned areas.
- Development of other sectors in former industrial areas can provide new options and development directions in cities.
- The potential development options must be defined for the future of cities in the planning system.
- The Brownfield areas must have spatial data analysis for urban regeneration implementation.
- Turkish urbanization standards must take into consideration in every part of city that makes to understand us priority of city development.
- Design decision model proves that the design should cover the necessity of city development.
- The methodology shows that Brownfield problems need an analysis from macro scale to micro scale.

To achieve these strategies, problems associated with a definite conceptual structure are considered and the analysis of the macro and micro scale on the point of view of the design decision model (COBO and FORTUNY, 2000) is focused. The methodology allows abandoned areas to be regenerated in a realistic solution approach for Turkish cities. A research method must be appropriate to explore macro and micro scales and to test research hypotheses on the case study. An important aspect of this study`s research is that it uses a new methodological approach to Brownfield redevelopment. This methodology can be useful for every abandoned area and every shrinking city. The conceptual model presents an explanation of sustainable development for the use of ecological, economic, and social characteristics of areas to guide Turkish cities.

As we have seen, the data is consistent across the two separate methods. It seems that the model of design decision is a consequence of derelict areas in a scientific manner. The findings of the present method define an accurate solution for Brownfield areas. Finally, the regeneration solution and design model of derelict areas are linked to the quantitative and qualitative analyses. The final point to this solution approach is that this method (design decision model) is the only sustainable solution for abandoned areas.

Consequently, the methodology reveals new development dimensions which unite global culture, and preferred social, economic and characteristics of areas. The methodological approach focuses on an appropriate solution for sustainable development. Substantive integration of macro and micro scales are examined to support a sustainable solution for every aspect of the shrinking problem. The last parts of the methodological approach suggest that the design decision model can help to create an innovative and accurate solution for in Brownfield redevelopment.

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APPENDICIES

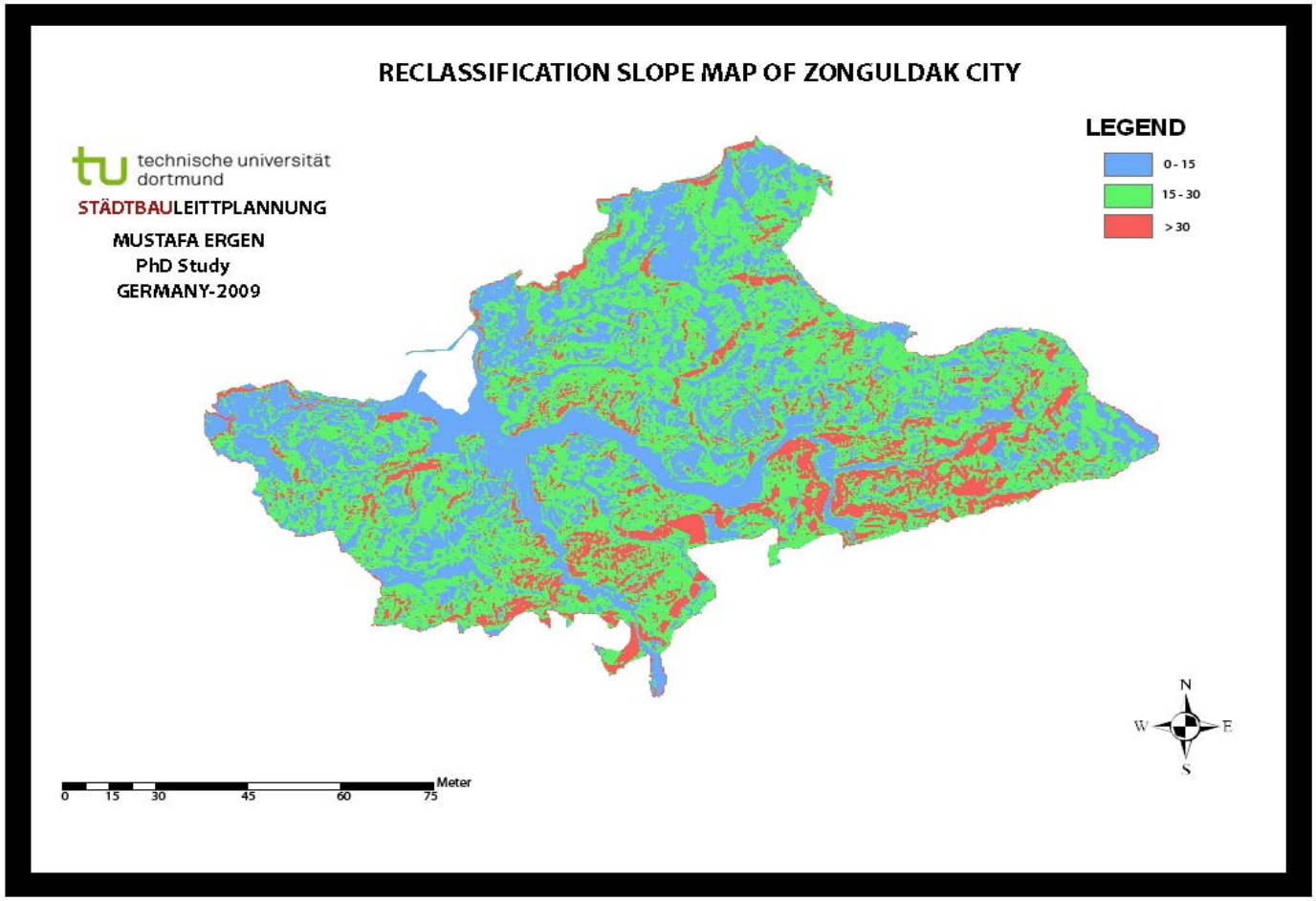
ZONGULDAK (CITY CENTER)

CURRENT LAND USE INFORMATION

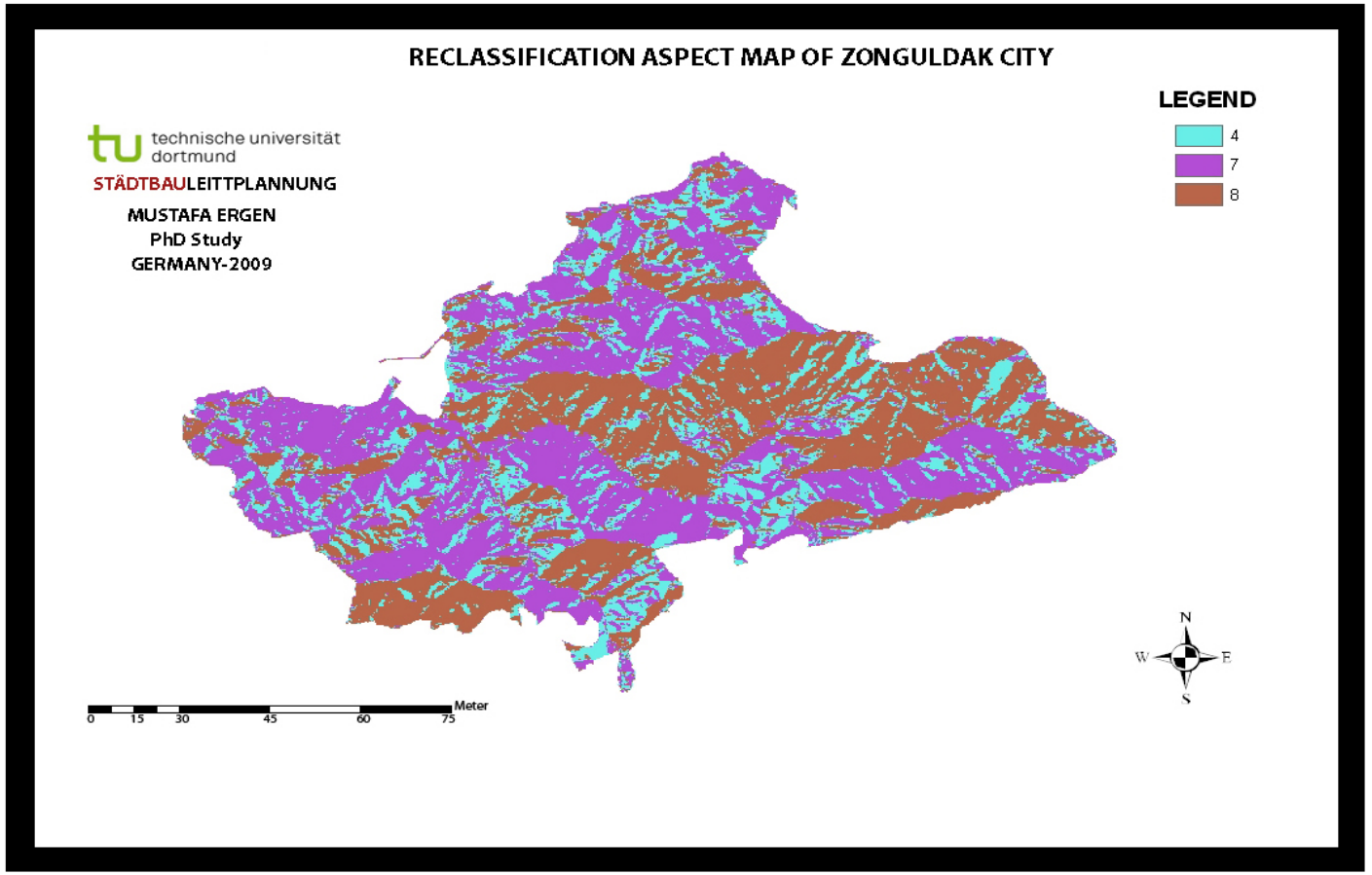
VALUES of SPATIAL USAGE

TYPE OF AREAS	AREAS (HA)	%
SETTLEMENT AREAS	**696.47**	**28.42**
URBAN WORKSPACE (STORAGE, MANUFACTURE-INDUSTRIAL AREAS, etc…)	**48.66**	**1.99**
URBAN SOCIAL INFRASTRUCTURE AREAS (TRADE AREAS, EDUCATIONAL AREAS, UNIVERSITY, SOCIAL-CULTURAL AREAS, SPORT AREAS, etc…)	**253.08**	**10.33**
ACTIVE GREEN AREAS (PARK, PLAYGROUND, RECREATION AREAS, etc…)	**131.79**	**5.38**
URBAN TECHNICAL INFRASTRUCTURE AREAS (RAILWAY AREAS, TECHNICAL INFRASTRUCTURE AREAS, CANAL, ROADS, etc…)	**426.74**	**17.42**
TOTAL of URBAN RESIDENTIAL AREAS	***1556.74***	***63.53***
OTHER GREEN AREAS (AFFORESTRATION AREAS, HIGHWAY PROTECTION BAND, etc…)	**425.58**	**17.37**
FOREST AREAS (FOREST ATTRIBUTE AREAS)	**365.36**	**14.91**
RESERVE DEVELOPMENT AREAS	**102.64**	**4.19**
OTHER AREAS	***893.59***	***36.47***
GENERAL TOTAL	**2450.33**	**100.00**

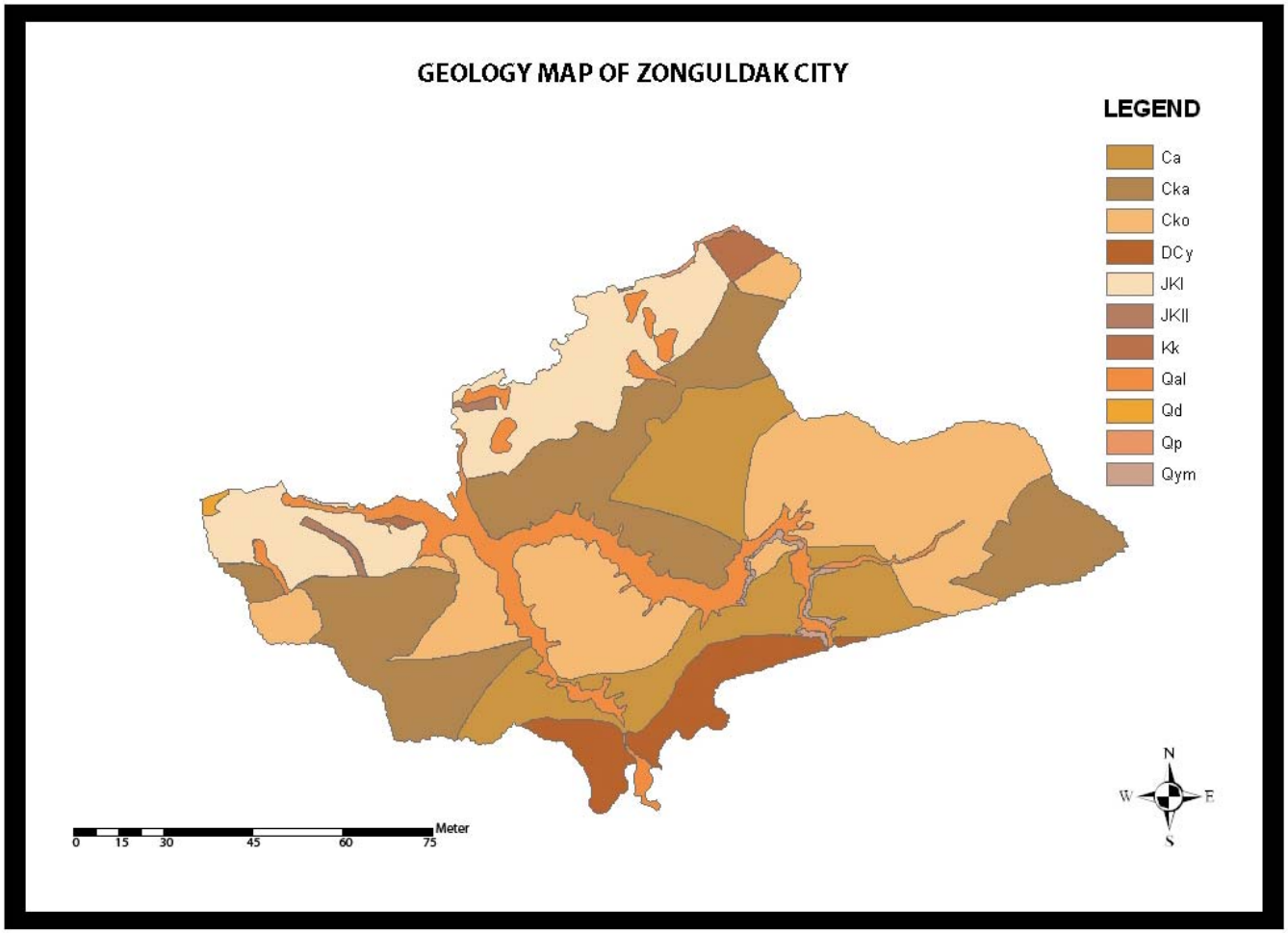
Source: Anonymous, 2006, Zonguldak Belediyesi Genel Yaklaşım Raporu, Modül Planlama Harita Bilgisayar İnşaat ve Ticaret Ltd. Şti., Ankara



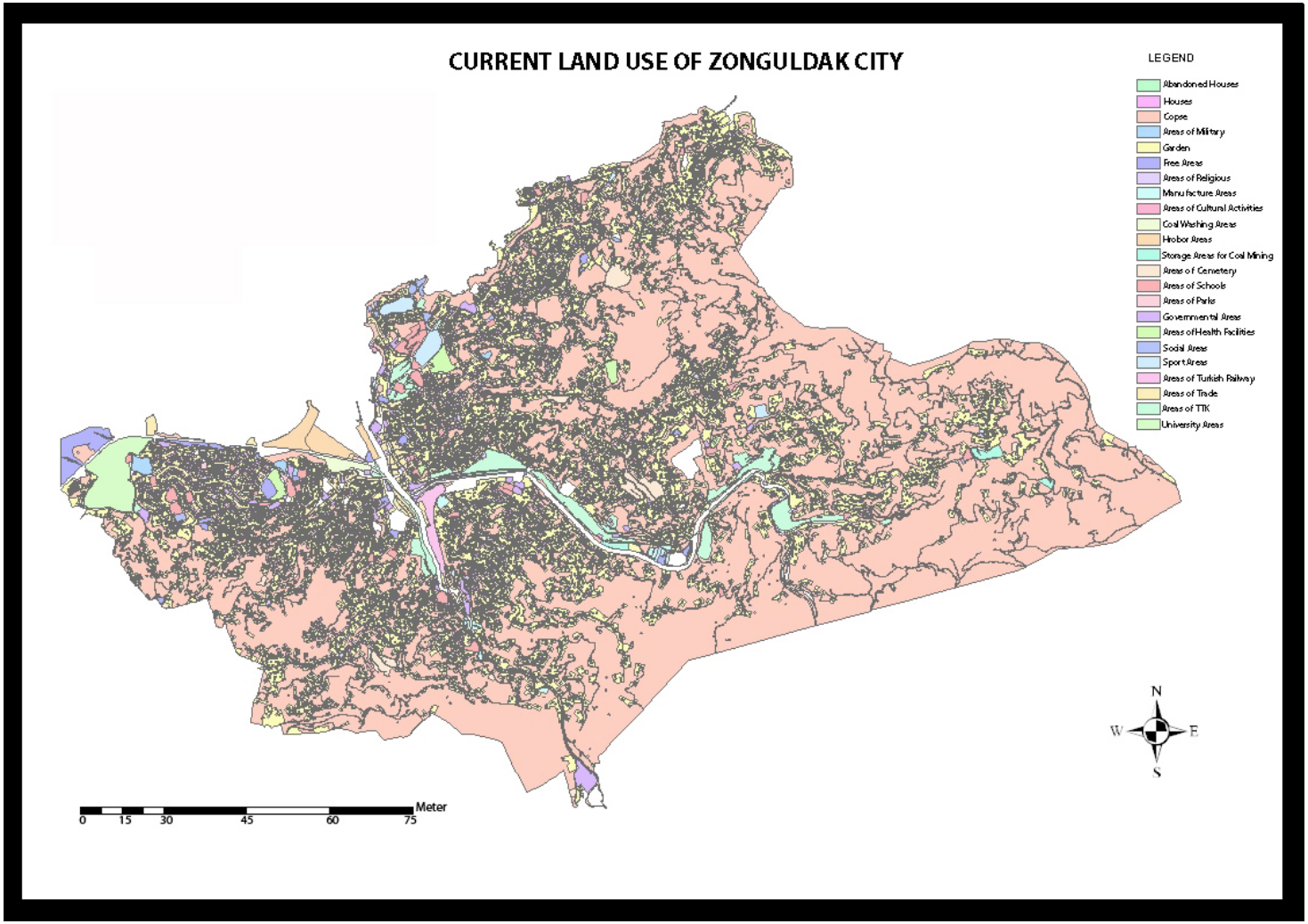
Source: Mustafa ERGEN, 2009, (Author`s own construct)



Source: Mustafa ERGEN, 2009, (Author`s own construct)



Source: Anonymous, 2005, "Zonguldak Belediyesi İmar Planına Esas Jeolojik-Jeofizik-Jeoteknik Etüd Raporu", ARE Jeoteknik Müh. Müş. Ltd. Şti., Ankara



Source: Anonymous, 2006, Zonguldak Belediyesi Genel Yaklaşım Raporu, Modül Planlama Harita Bilgisayar İnşaat ve Ticaret Ltd. Şti., Ankara

GRID MATRIX FOR SLOPE, ASPECT, GEOLOGY, LAND USE

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
SLOPE	%0-15	34,74	53,40	66,21	10,38	32,81	38,39	64,90	11,04	38,58	52,50	66,61	62,88	10,05	23,53	53,36	34,32	36,22	19,33	22,97	11,01	41,09	29,77	47,18	48,92	19,66	40,15	31,92	27,32	45,48	17,20	20,88	23,64	12,02	25,46	5,50	14,60	32,54	23,75	16,13	65,59	56,25
	%15-30	59,67	38,53	17,71	65,69	59,70	52,69	27,35	64,33	58,19	38,77	28,65	30,07	51,55	51,68	40,22	55,86	53,29	57,42	46,29	55,71	50,66	62,56	48,48	43,41	55,54	40,47	58,18	62,95	48,49	44,50	46,89	64,94	72,01	55,87	48,76	47,42	58,11	60,47	64,34	28,91	0,00
	>%30	5,58	8,07	16,09	23,93	7,48	8,92	7,75	24,63	3,23	8,73	4,74	7,04	38,40	24,79	6,43	9,82	10,49	23,26	30,74	33,29	8,25	7,67	4,34	7,67	24,79	19,38	9,90	9,73	6,03	38,29	32,24	11,42	15,97	18,67	45,74	37,98	9,36	15,77	19,53	5,50	43,75
ASPECT	4	14,35	22,80	16,66	10,45	22,23	16,32	5,57	6,17	18,64	26,50	26,12	23,33	18,28	25,63	20,51	16,82	24,20	14,04	41,11	23,64	19,76	18,57	24,74	30,73	24,73	29,97	15,48	23,43	26,27	23,66	19,12	26,73	21,52	19,56	8,06	13,49	15,04	17,65	28,34	26,70	25,00
	2	82,38	56,47	70,62	2,30	47,86	66,91	93,86	0,33	50,70	56,72	39,48	50,00	45,28	41,33	55,34	35,26	62,70	28,99	34,15	39,90	36,39	41,11	48,59	48,76	65,38	30,70	25,60	51,85	56,44	38,31	39,44	8,20	77,10	74,47	9,75	48,43	4,29	52,27	9,84	38,69	37,50
	1	3,27	20,73	12,71	87,25	29,91	16,78	0,56	93,49	30,67	16,77	34,40	26,67	36,43	33,04	24,15	47,93	13,09	56,97	24,74	36,46	43,85	40,32	26,66	20,51	9,88	39,33	58,93	24,72	17,28	38,03	41,45	65,07	1,38	5,97	82,18	38,09	80,68	30,08	61,81	34,61	37,50
GEOLOGY	CKO	100,00	8,68	0,00	0,00	10,53	2,29	0,00	0,00	32,65	33,91	0,00	0,00	0,00	40,36	55,51	0,00	0,00	0,00	0,00	49,13	23,39	0,00	0,00	0,00	0,00	16,87	38,80	0,07	26,01	0,00	33,88	99,58	80,00	100,00	12,35	84,52	100,00	4,03	68,55	0,00	0,00
	CKA	0,00	19,96	0,00	100,00	89,47	32,03	0,00	63,69	62,67	28,01	23,83	0,00	0,00	5,95	10,61	67,03	0,00	0,00	0,00	0,00	44,57	37,49	27,22	0,00	0,00	21,64	0,00	60,36	18,15	0,00	0,00	0,00	0,00	0,00	0,00	7,18	0,00	95,97	31,45	100,00	100,00
	KK	0,00	0,00	0,00	0,00	0,00	1,45	0,00	0,00	0,00	1,55	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	28,53	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	CA	0,00	0,00	0,00	0,00	0,00	0,00	72,47	36,31	4,68	0,00	0,00	0,00	34,72	35,96	0,00	0,00	0,00	0,00	14,32	36,96	1,50	59,14	4,07	0,00	40,41	31,57	60,86	35,41	0,00	54,05	48,86	0,00	20,00	0,00	87,65	5,57	0,00	0,00	0,00	0,00	0,00
	QAL	0,00	6,65	8,51	0,00	0,00	3,13	0,00	0,00	0,00	27,26	27,99	26,39	0,00	17,73	33,88	5,28	3,57	0,00	13,81	4,60	30,54	0,00	13,72	10,91	1,91	25,61	0,34	0,00	0,00	12,62	13,61	0,42	0,00	0,00	0,00	2,73	0,00	0,00	0,00	0,00	0,00
	JKU	0,00	0,00	0,00	0,00	0,00	6,70	27,53	0,00	0,00	0,00	0,00	27,14	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	JKI	0,00	64,14	75,80	0,00	0,00	54,41	0,00	0,00	0,00	9,28	48,17	46,47	0,00	0,00	0,00	27,70	96,43	100,00	0,00	0,00	0,00	3,38	54,99	83,94	0,00	0,00	0,00	4,16	24,41	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	QYM	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	4,32	0,00	0,00	0,00	11,68	3,64	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	DCY	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	65,28	0,00	0,00	0,00	0,00	0,00	71,87	9,31	0,00	0,00	0,00	0,00	57,68	0,00	0,00	0,00	0,00	21,65	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	QD	0,00	0,58	15,69	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	QP	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	5,15	0,00	0,00	0,00	0,00	2,90	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0	0,00	0,00
LAND USE	Areas of Schools	0,00	2,83	0,00	0,00	0,00	3,12	0,00	0,00	0,48	2,43	6,29	0,89	0,00	1,76	2,15	3,01	3,14	0,00	0,00	0,00	0,27	0,31	0,56	2,75	0,00	0,39	0,07	0,88	0,00	0,23	0,24	0,00	0,00	0,00	0,00	0,41	0,14	0,00	0,00	0,00	0,00
	Garden	20,00	26,44	5,30	33,71	22,52	41,34	23,89	14,33	31,52	38,31	23,43	33,04	4,56	37,18	42,76	46,55	42,76	75,00	8,87	22,71	40,54	29,50	36,80	46,53	0,00	10,06	26,81	35,00	11,85	40,94	26,59	17,25	1,23	31,58	1,53	10,54	20,44	5,54	5,98	2,36	0,00
	Areas of Military	0,00	3,18	0,00	0,00	0,00	0,89	0,00	0,00	0,00	0,28	0,63	0,00	0,00	0,00	0,00	0,45	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Free areas	2,96	4,55	42,05	0,00	0,00	2,80	21,24	0,00	0,00	1,53	2,83	0,00	0,00	0,00	1,14	0,00	0,00	0,00	0,00	0,00	0,27	0,00	0,68	0,00	0,00	0,00	1,16	0,25	0,00	0,00	0,43	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Governmental areas	0,00	1,03	3,03	0,00	0,00	1,53	0,00	0,00	0,00	2,64	5,82	0,00	0,00	1,39	2,22	0,13	1,68	0,00	5,20	0,00	0,41	0,00	0,00	0,65	0,00	0,00	0,41	0,44	0,00	0,00	0,06	0,00	0,00	0,00	0,00	0,12	0,00	0,00	0,00	0,00	0,00
	Copse	65,19	24,81	10,61	61,24	72,17	19,68	6,19	82,59	55,11	14,09	3,30	28,13	94,58	43,04	8,42	20,40	28,40	3,13	83,18	73,13	28,11	56,60	47,25	35,38	100,00	87,58	50,41	52,06	84,39	47,16	59,33	78,19	96,91	63,16	98,47	85,30	73,57	92,32	93,07	97,38	100,00
	Areas of Religious	0	0,17	0,00	0,00	0,20	0,32	0,00	0,00	0,12	0,69	0,31	0,00	0,00	0,25	0,40	0,45	0,56	0,00	0,00	0,12	0,20	0,25	0,12	0,65	0,00	0,00	0,07	0,25	0,06	0,15	0,18	0,00	0,00	0,00	0,00	0,00	0,14	0,00	0,00	0,00	0,00
	Areas of Parks	0,00	0,00	0,00	0,00	0,00	1,08	0,00	0,00	0,00	0,62	1,26	0,00	0,00	0,00	0,00	0,13	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,14	0,00	0,00	0,23	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Areas of Health Facilities	0,00	0,00	0,00	0,00	0,00	2,68	0,88	0,00	0,00	0,07	0,00	0,00	0,00	0,00	0,54	3,45	0,00	0,00	0,00	0,00	0,00	1,89	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Areas of Trade	0,00	2,23	9,47	0,00	0,00	3,82	4,42	0,00	0,00	13,12	7,86	0,00	0,29	0,19	2,42	0,19	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Areas of Cemetery	2,96	0,17	0,00	0,00	0,60	0,19	0,00	0,00	3,21	0,00	0,00	0,00	0,00	0,88	0,40	0,00	0,00	0,00	0,92	0,00	4,66	1,07	4,14	0,00	0,00	0,00	2,26	0,00	0,00	0,15	0,67	0,37	0,00	0,75	0,00	0,29	0,42	0,00	0,47	0,00	0,00
	Areas of TTK	0,00	0,69	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,53	11,48	0,00	0,00	0,25	12,19	0,45	1,91	0,00	0,00	0,00	9,86	0,00	0,00	0,00	0,00	0,00	9,71	0,25	0,00	0,00	7,20	0,25	0,00	0,00	0,00	0,12	0,00	0,00	0,00	0,00	0,00
	Areas of Turkish Railway	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,57	6,94	0,00	0,79	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,62	0,00	0,00	0,00	0,00	0,00	0,69	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Areas of Cultural Activities	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,14	0,31	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Sport Areas	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	23,21	0,00	0,19	0,07	4,03	1,12	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,41	1,13	0,00	0,00	0,00	0,06	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Manufacture Areas	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,07	1,08	0,00	0,00	0,00	0,10	0,24	0,00	0,00	0,00	0,48	0,00	0,00	1,37	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,14	0,00	0,00	0,00	0,00
	Storage Areas for Coal Mining	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,15	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,06	0,00	0,00	0,00	0,00	0,00	0,00	1,23	0,99	0,92	0,00	0,00	0,00
	Harbor Areas	0,00	0,00	0,00	0,00	0,00	0,00	33,63	0,00	0,00	1,39	29,09	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Social Areas	0,00	0,00	0,00	0,00	0,00	0,64	0,00	0,00	0,00	0,07	0,31	6,25	0,00	0,00	0,00	0,00	2,81	0,00	0,00	0,00	0,00	0,00	0,25	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Coal Washing Areas	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	4,09	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	University Areas	0,00	25,41	27,27	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Houses	6,67	8,33	2,27	5,06	4,50	21,66	9,73	2,90	9,32	18,74	6,76	8,48	0,57	12,98	18,99	20,65	16,72	21,88	1,53	3,80	14,32	10,13	10,08	11,79	0,00	1,97	7,11	9,31	3,56	10,29	5,12	3,51	1,85	4,51	0,00	1,99	4,09	1,21	0,38	0,26	0,00
	Abandonned Houses	2,22	0,17	0,00	0,00	0,00	0,25	0,00	0,17	0,24	0,28	0,31	0,00	0,00	0,25	0,27	0,13	0,11	0,00	0,20	0,00	0,20	0,25	0,12	0,16	0,00	0,00	0,07	0,44	0,06	0,15	0,18	0,37	0,00	0,00	0,00	0,00	0,07	0,00	0,09	0,00	0,00

Source: Mustafa ERGEN, 2009, (Author`s own construct)

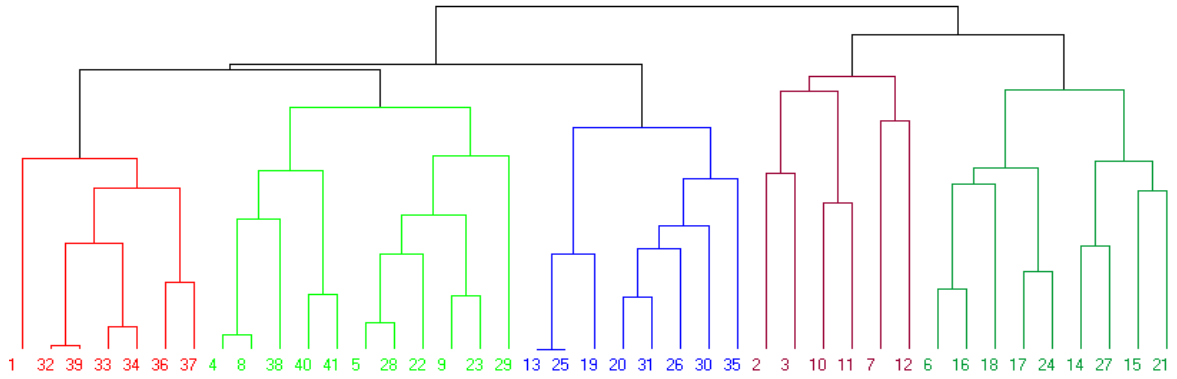
APPENDIX-VII

DENDROGRAM DEPENDS ON SIMILARITY of DISTANCE for VARIABILITY

1	32	39	33	34	36	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	8	38	40	41	5	28	22	9	23	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	25	19	20	31	26	30	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	3	10	11	7	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	16	18	17	24	14	27	15	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Mustafa ERGEN, 2009, (Author`s own construct)

AGGLOMERATIVE HIERARCHICAL CLUSTER ANALYSIS



Source: Mustafa ERGEN, 2009, (Author`s own construct)

APPENDIX-VIII

30 YAERS of TEMPERATURE for ZONGULDAK CITY

	January	February	March	April	May	June	July	August	September	October	November	December
1980	4,4	4,8	6,5	10	16,3	20	21,3	21,4	17	16,7	13,5	9,4
1981	7,4	6,3	8,5	10,6	13,7	20,2	21,5	21,6	18,7	17,2	10,4	9,5
1982	5,7	3,6	6	10,6	13,3	20	20,1	20,8	19,7	15,2	10	11,8
1983	5,1	6,2	8,4	13,1	17	18,9	22,1	20,5	18,5	13,7	9,7	10,1
1984	8,2	6	8,1	8,3	17,4	19,1	20,6	19,6	19,7	15,9	11,5	8,7
1985	7,5	1,6	5,1	12,3	16,9	18,9	19,6	21,3	17,1	12,4	12,8	6,4
1986	8,5	6,7	5,9	11,3	13,2	20,5	21,1	22,3	18	13,7	8,5	8,9
1987	5,8	7	3,9	9,6	15	19	21,7	20,3	18,3	13,3	12,4	6,9
1988	7,2	6,3	8,9	10,5	14,5	19,8	22,8	21,7	18,2	13,9	7,9	7
1989	3,9	5,9	8,6	14,6	15,7	19,2	21,2	22,2	18,5	14	10,2	7,3
1990	4,2	6,1	7,8	12,3	14,2	19,5	21,5	20,7	17,2	14,6	14,1	7,9
1991	5,8	4,5	5,3	10	15,3	18,9	22	21,8	17,7	15,4	11,7	9,2
1992	4,2	3,2	7,3	11,9	12,6	19,9	20,1	22,4	17,1	17,7	10,5	4,9
1993	4,6	2,7	7,6	10,2	14,3	19,4	20,2	21,4	18,2	16,1	8,5	5
1994	7,9	5,5	8,1	13,6	16,6	19,1	22,2	22,6	21,4	17,4	9,2	9,6
1995	6,8	7,3	8,9	11,3	16,1	20,4	21,8	21,8	19,2	13	8,6	6,7
1996	4,7	6,1	3,9	8,7	17,5	18,8	22,2	21,7	18,3	13,6	12,4	7,6
1997	6,5	4,6	4,8	8,6	16,1	19,7	22,2	20,5	15,8	14,4	11,6	10,8

1998	6,9	5,3	6,2	14,7	15,6	20,6	22,3	22,9	19,1	16,4	12	8,4
1999	7,3	6,8	8,7	13,6	15,6	20,2	23,4	22,6	19,1	14,8	10,4	6,9
2000	2,8	5,9	7,2	13,5	15,1	18,7	23,1	21,6	19	14,3	14	11
2001	8,1	7,3	12,7	12,4	15	19,9	24,2	23,2	20,1	15,1	11,1	9,3
2002	4,6	9	10	9,4	14,9	20,6	24,3	22,4	19,8	16,1	13,2	5,9
2003	8	2,9	3,7	8,7	15,4	19,9	22,4	22,3	17,6	15,9	10,8	7,3
2004	5,6	5,4	7,9	11,7	14,7	19,5	21,1	21,7	19	15,6	12	8,9
2005	7,1	6,7	6,5	11,9	15,7	18,8	22,8	23,8	19,6	13,6	10,4	8,7
2006	4,2	5,3	8,6	10,8	15,2	20	21,5	24,5	19,4	16,2	10,3	7,7
2007	9,1	7,3	9,2	9,8	17,2	21,7	23,4	23,7	19,8	14,7	11	6,9
2008	4	5,4	11,6	15	14,1	20,4	22,4	23,2	19,3	16,1	12,7	9,2
2009	7,6	7,8	7,9	9,4	15,9	20,8	23	21,4	19,2	17,9	12,4	11,2
2010	7,8	9,2	8	11,5	17,4	21	23,9	25,7	20,3	14,4	17,1	11,7
Average	6,18	5,76	7,48	11,29	15,40	19,79	22	22,05	18,71	15,14	11,32	8,41

Source: Anonymous, 2011, Report of Zonguldak Meteorological Service, Zonguldak

APPENDIX-IX

30 YAERS of PRECIPITATION for ZONGULDAK CITY

	January	February	March	April	May	June	July	August	September	October	November	December
1980	214,8	60,9	155,6	32,4	75,2	27,3	11,9	48	88,8	84,4	173,7	197,5
1981	167,4	120,7	110,5	41,2	39,7	26,2	42,8	75,8	110,3	212,8	119,2	186,8
1982	160,4	57,7	152	72,7	30,8	25,6	83,3	251,2	12,8	58,1	64,8	175
1983	223	85,8	22,7	51,3	20,9	19,3	253,3	87,8	20,6	206,6	115,6	84,7
1984	127,6	69,2	64,7	149,8	19	120	207,5	111,8	6,3	108,1	172,6	40,9
1985	150,7	161,8	28,2	63,1	43	78,5	51,7	20,8	45,1	255,1	62,2	136,3
1986	141,9	101	18	31,3	40	124,9	41,6	1,8	25	181,1	163,9	126,6
1987	228,4	53,1	146,7	84,8	48,2	62,1	65,8	111,6	0,9	211,8	113,1	231,7
1988	72,1	87,7	87,5	60,6	36,4	50,2	240,5	28,4	60,9	220,8	271,7	127,7
1989	50,2	55,6	28,2	15	70,5	51,5	40,2	8,7	332,3	224,5	275,8	100,7
1990	94,5	59,2	58,7	65,7	83,9	81,7	91,2	31,7	221,5	164,8	91,8	143,4
1991	76,8	104,9	35,1	73,7	112,5	145	145,6	114,6	299,8	212,2	110,4	201,3
1992	68,4	112,2	78,3	51,1	36,1	180	133,2	0,4	95,3	157,2	163,5	141,2
1993	104,8	72,6	50,5	30,7	59,2	33,7	12,9	61,8	62,6	23,8	200,6	105,6
1994	116,8	39	45,2	38,8	85	64	2	75,5	0,6	243,8	301,7	183,2
1995	152,7	52,1	157,5	84,1	14,2	74,3	142,4	35,4	143,5	112	290,4	96,5
1996	102,2	84,5	125,7	68,2	22,7	38,3	42,1	77,3	201,4	193,1	34,3	211,7
1997	72,9	104	121,1	155,2	33,1	105,4	223,4	341	24,6	275,5	44,7	165,2

1998	117,9	96,9	130,8	38,4	229,9	64,4	100	4,3	115,9	169,8	131	225,4
1999	82,6	127,8	65,2	13,6	32,3	152,4	19,3	108,5	104,1	144,8	205,5	74,5
2000	234,7	83,2	131,2	63,9	30,2	227,5	26,3	270,5	353,2	148,1	9,4	161,9
2001	51,2	93,1	84,2	68,4	64,6	48,4	26,1	86,1	190,3	34,9	246	266,2
2002	115,8	14,6	63	61,6	47,4	48,4	94,7	151,6	139,5	203,3	93,8	98,8
2003	99,9	129,7	84	62,5	14,6	0	92	11,4	200	148,9	117,5	174,8
2004	173,1	103	116,3	31,9	72,4	82,8	17,7	239,5	61,9	44,3	289,3	125,5
2005	227,9	79,5	105,4	52,3	15,2	87,8	69,5	13,3	125,8	294	176,1	154,5
2006	128,2	139,6	80,9	4,5	30,9	59,4	29,7	7,8	120,2	76	181,2	65,2
2007	136,2	33,6	75,3	45	51	53	34	159,6	134,5	174,2	206,8	169,6
2008	87,8	101,3	154,7	24,8	60,1	49,7	46,8	2,6	242,4	96	136	156,5
2009	123,9	140,3	130,2	59,9	35,4	53,8	168,1	9,1	167,3	78,6	120	148,2
2010	186,6	86,4	142,9	40,9	10,9	72,1	9,4	5,8	172,1	171,2	26	209,3
Average	131,98	87,45	91,95	56,05	50,49	74,44	82,74	82,38	125,15	159,03	151,89	151,17

Source: Anonymous, 2011, Report of Zonguldak Meteorological Service, Zonguldak