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Research Article

The Importance of Geological-Geotechnical Studies in Planning and The Karapınar (Konya) OIZ Example

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Abstract

With the Industrial Revolution, an uncontrolled migration wave from rural areas to large cities occurred. The sudden increase in population density in cities caused the formation of unplanned and uncontrolled areas. Due to the increasing population, consumption increased, the demand for equipment required to facilitate daily life and increase life comfort increased, industrialization grew rapidly to meet these consumption needs and the demand for new industrial areas and raw materials increased in parallel with the growth. In countries with intense socio-economic developments, it has become necessary to direct and develop industries within the framework of specific plans and programs. Due to these sudden and rapid developments, planned industrial facilities and specialized industrial zones have increased in importance as much as planned urban areas. Organized Industrial Zones (OIZ) are important for the development of industry to solve regional imbalances. In Karapınar Organized Industrial Zone (OIZ), it is aimed to determine the geological characteristics of the selected area together with the selection of the location, to determine the soil groups and soil index parameters of the examined area before planning, and to make planning following these soil groups. In areas planned without deciding the characteristics of the soil types, material losses, as well as moral losses, occur due to faulty planning originating from the characteristics of the soil, especially due to different settlements. To prevent design errors originating from the soil characteristics and to realize more functional plans, determining the soil index and parameters of the region is among the design factors. As a result of this study, the soil generally consists of fine-grained silt-clay, and silt-fine sand alternation. Within this unit, gravelly coarse sand transitions were observed in the form of lenses. Although the soil in the study area is generally composed of CH, CL group clays, it was understood that CH group cohesive soil is more common.

Planlamada Jeolojik - Jeoteknik Etüd Önemi ve Karapınar (Konya) O.S.B. Örneği

Anahtar Kelimeler
Karapınar
OSB
Zemin Özelikleri

Özet

Sanayi devrimi ile birlikte büyük kentlere kırsal alanlardan kontrolsüz bir göç dalgası meydana gelmiştir. Kentlerde artan ani nüfus yoğunluğu plansız ve kontrolsüz alanların oluşmasına neden olmuştur. Artan nüfusa bağlı olarak tüketim artmış, günlük hayatı kolaylaştırmak ve yaşam konforunu artırmak için gerekli olan ekipmanlara talep artmış, bu tüketim ihtiyaçlarını karşılamak için sanayileşme hızla büyümüş ve büyümeye paralel olarak yeni sanayi alanlarına ve hammaddeye olan talep artmıştır. Sosyo-ekonomik gelişmelerin yoğun bir şekilde yaşandığı ülkelerde sanayilerin belirli bir plan ve programlar çerçevesinde yönlendirilerek geliştirilmesi artık bir zorunluluk olmuştur. Bu ani ve hızlı gelişmelerden dolayı planlı kent alanları kadar planlı sanayi tesisleri, ihtisas sanayi bölgeleri önemi artmıştır. Organize Sanayi Bölgeleri, bölgesel dengesizliğin çözümü için sanayinin gelişmesi için önemlidir. Karapınar Organize sanayi bölgesinde yer seçimi ile birlikte seçilen alanın jeolojik özeliklerinin belirlenerek planlama öncesinde inceleme alanın zemin grupları ve zemin indeks parametreleri belirlenerek, bu zemin gruplarına uygun olarak planlama yapılması hedeflenmiştir. Zemin türlerinin özelikleri belirlenmeden planlanan alanlarda farklı oturmalar başta olmak üzere zeminin özeliklerinden kaynaklı hatalı planlamalardan dolayı maddi kayıplar yanı sıra manevi kayıplar meydana gelmektedir. Zemin özeliklerinden kaynaklı tasarım hatalarının önüne geçebilmek ve daha fonksiyonel planlamalar gerçekleştirebilmek için bölgenin zemin indeks ve parametrelerinin belirlenmesi tasarıma eden faktörler içerisindedir. Bu çalışma sonucunda zemin genel olarak ince taneli silt-kil, silt-ince kum ardalanmasından oluşmaktadır. Bu birim içerisinde mercekler şeklinde çakıllı iri kumlu geçişler gözlemlenmiştir. İnceleme alanın genelinde zemin CH, CL grubu killerden meydana gelmekle birlikte, CH grubu kohezyonlu zemin daha yaygın olduğu anlaşılmıştır.

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INTRODUCTION

A wave of uncontrolled migration from rural areas to large cities occurred with the Industrial Revolution. The sudden increase in population density in cities caused the formation of unplanned and uncontrolled areas. Due to the increasing population, consumption increased, the demand for equipment required to facilitate daily life and increase the comfort of life increased, industrialization grew rapidly to meet these consumption needs and the demand for new industrial areas and raw materials increased in parallel with the growth. In countries with intense socio-economic developments, it has become necessary to direct and develop industries within the framework of specific plans and programs [1]. In our global world where rapid developments are experienced, achieving the desired socio-economic goals depends on the state and the private sector being able to fulfill their mutually supportive and complementary missions as required. In a sense, the state determines the basic strategies to guide the private sector by providing opportunities and establishing organizations that will make the necessary infrastructure investments [2]. Therefore, the importance of planned industrial facilities and specialized industrial zones has increased as much as planned urban areas. To solve the problems caused by scattered industry, to encourage industry, to distribute economic development equally to the regions, and to ensure the development of medium and small-scale enterprises throughout the country, the application of organized industrial zones has been adopted as an industrialization method in the policies implemented by the governments of developed and developing countries. After all these developments, a new understanding began to be included. The idea of organized industrial zones, which is a planned approach, was developed to create an industrial community operating with high efficiency, planned to be operated with high standards on a piece of land where industrial activities dominate other activities, close to but outside residential areas, with proper roads, green areas and enterprises that are also desired by the environment [3]. Many people lost their lives due to severe earthquakes and floods caused by natural disasters. Problems are still experienced today due to wrong regions selected as residential areas and various project errors. In urban planning, geological factors play an important role in the selection of the planned area. In urban planning, geological, geophysical, and geotechnical data have become increasingly important in identifying, controlling,g and reducing natural disasters [4-6].

Features of Organized Industrial Zones

Organized Industrial Zones are the planning of cities with the developing industry to solve regional imbalances and the placement of industrialization outside cities and in special areas separated from cities by green belts. It is an industrial incentive measure where environmental quality is kept at high value by moving industrial organizations that negatively affect the environment to regions where environmental pollution and industrial waste can be controlled and where infrastructure facilities have been created. For this reason, the application of organized industrial zones serves as an effective tool in regional development, encouraging investments, spreading industry throughout the country, and in the process of industrialization-urbanization harmony [3]. Some basic features taken into consideration in the establishment of organized industrial zones; Industries to be located in industrial zones should produce in cooperation with each other. Governments implement OIZs to direct a healthy urban texture and urban development. The organizations to be located in these zones should be small and medium-sized enterprises. Organized Industrial Zones should be established in standard factory buildings in places far from environmental problems. In regions where the infrastructure is ready, it is established to benefit from common infrastructure services such as electricity, water, sewage, road network, and transportation services [1,3,7]. The Importance of Geological Geotechnical Studies in Organized Industrial Zones Location selection is important for sustainable development and forms the basis of correct planning. For this reason, the effective use of the selected land and its compliance with the determined purposes is a precautionary start to sustainable development. There are many factors that control the selection of settlements. "Urban Planning" is indispensable for disasters to affect settlement areas minimally and for correct land use [8]. In this context, zoning plans made for a specific area or region have an important role in terms of healthy construction and the creation of cities. These plans are long-term and large-scale and aim to create urbanization and physical facilities at high standards in the future.

MATERIAL AND METHOD

10.00 meter deep foundation drilling studies were carried out to determine the suitability of the organized industrial zone planned to be established in Karapınar with an area of approximately 150 ha for settlement and ground index parameters. Tests and experiments (such as water content, sieve analysis, and natural unit volume weight) were carried out on the samples obtained from the foundation drilling studies to determine the index parameters. Evaluations were carried out by combining the field studies and experimental results.

RESULT AND DISCUSSION

General Geology

The study area consists of the Cihanbeyli Formation, which is composed of light white-gray marl, clayey limestone, and tuff intercalations in some areas. This formation presents quite wide distributions in the study area and its surroundings. In the northeast of the study area, the Cihanbeyli Formation, which is observed as horizontally layered and occasionally with dissolution cavities, is overlain by undifferentiated basalts and andesites belonging to the lower members of the Karacadağ volcanic. The young volcanics, which play an active role in the formation of the morphology of the region, are mostly composed of basalt, andesitic basalt, trachybasalt, and pyroclastics. The units in the study area are covered by Quaternary alluvium, slope debris, and current formations [9]. The basalt, which generally does not originate from the volcanics in the region, is composed of volcanics with basaltic andesite composition overlying the pyroclastics. The volcanics, which are observed as plains in partially wide areas, present a porphyro-aphanitic texture. Basalts are dark gray-blackish in the hand sample and amygdaloidal texture is seen locally. Trachyte-trachyandesite composition rock fragments with dimensions ranging from 0.3 to 4 cm are also seen in these basalts. Another rock group presenting porphyro-aphanitic textural feature in the study area and the surrounding area are andesites and trachyandesites. Andesites can be distinguished from other rock groups by their light pink color in the hand sample, and trachyandesites by their gray color and flow texture [10,11] (Figure 1).

Geology of the Study Area

Karapınar and its immediate surroundings consist of alluviums. The alluvial unit consists of clay, silt, fine sand, and sandstone. In the north of the Ereğli - Karapınar road in the east of Karapınar, sand, silt, gray and green colored clay are dominant in the study area of the OSB. In the north of the Karapınar - Ereğli road, claystone is dominant in the western settlement areas of Karapınar. There are plenty of shells belonging to freshwater organisms in both regions (Figure 1). The dominant lithological unit in the study area consists of lacustrine stacks consisting of clay, silt, and silty sand, starting at the end of the Pliocene and deposited throughout the Quaternary, with a thickness varying between 30-50 m. These deposits unconformably overlie the Mio - Pliocene aged İnsuyu formation. The Karapınar volcanics observed in the region are observed in the south, southeast, and east of Karapınar.

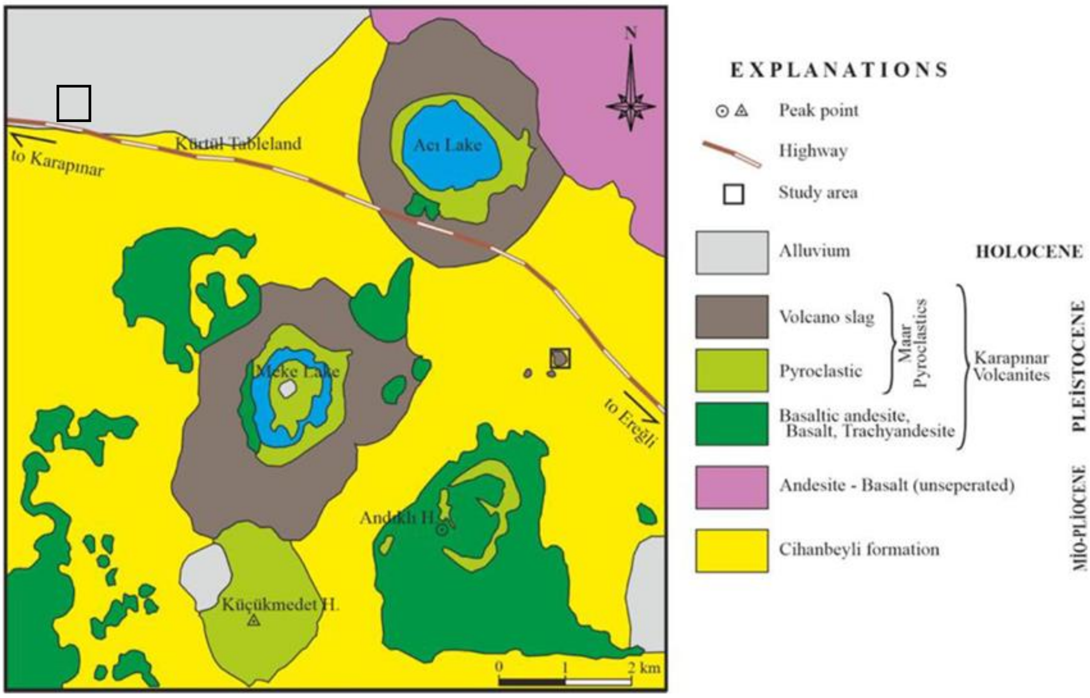

Figure 1. Geological map of the study area ([10,11], partially modified from)

The volcanic cones formed on the opening cracks developed in the direction suitable for the Karacadağ volcanic line and the pyroclastics coming out of the fissure volcanism give outcrops in the form of basaltic lavas. These volcanic products with slightly alkaline quality surround our study area from the south and southeast. The volcanic products with basaltic character, those in the size of volcanic bombs, slag, and ash reached the surface with violent explosions, and then basaltic lava flows came. As a result of the applied experiments and field observations, it was determined that the unit consisting of clay, silt, and silty sand in the study area has a medium-high water content in the precautionary areas. In general, almost the entire part of the region consists of highly plastic swellable inorganic clays and silt clays (CL and CH). According to Leonards 1962 [12] classification, the plasticity degree of the clays is in the plastic class according to the plasticity index (% 15 - 40), and the dry strength is medium plasticity [12]. When the clays in the study area were examined in terms of activity, it was determined that they were medium-high activity in the activity chart, and that they were in the normal clay class according to the activity values. When the clays in the field were evaluated in terms of swelling potential, the plasticity index was between (25 - 40), hard - very hard, and the shrinkage limit (SL) was medium-high [12].

Basic Drilling Results

According to the drilling results opened to represent the general soil index parameters of the study area, samples taken from the SK-1 well are high plasticity clay (CH) up to 3.00 meters from the surface, low plasticity clay-silt (ML) between 3.00-4.00 meters, clay-silt, 50 sand (SM) between 4.00-6.00 meters, low plasticity clay-silt (ML) between 6.00-7.00 meters, high plasticity clay (CH) at 7.00-9.00 meters, clay-silt- sand (SM) between 9.00-9.45 meters, high plasticity clay (CH) but also low plasticity clay (CL) bands in the form of thin bands were observed in the SK-2 well up to the first 8.50 meters from the surface. It was observed that it is composed of clay silt and sand (SM) between 8.50-10.50 meters. In SK-2, the ground is predominantly high plasticity clay (CH) at a depth of 8.50 meters from the surface and is low plasticity (CL) clay at some levels. The ground between 8.50-10.00 meters is in the SM group. In SK-3; The ground is low plasticity clay (CL) at a depth of 2.00 meters from the surface. The ground between 2-3 meters is in the SP-SM sand-silt-gravel soil group. The ground between 3.00-4.50 meters is low pastiche clay (CL). The ground between 4.500-6.00 meters is sand-silt in the SM group. It is ML clay silt between 6.00 and 7.50 meters. The ground between 7.50 and 9.00 meters is SM sand-silt. Between 9.00-10.50 meters the ground is SP-SM sand-silt-gravel. In SK-4; The ground up to a depth of 2 meters from the surface is clay-silt-sand (SM). Between 2.00 and 7.50 meters, the ground is predominantly low plasticity clay and high plasticity clay is also present. Between 7.50-9.00 meters, the ground is SP-SM gravel group. Between 9.000 and 10.50 meters, the ground is low plasticity clay. In SK-5; Up to a depth of 4.50 meters from the surface, the ground is low plasticity clay (CL). Between 4.50-10.50 meters the ground is in the clay-silt-sand (SM) group. In SK-6; Up to a depth of 7.50 meters from the surface, the ground is predominantly high-plasticity clay and there are low-plasticity clay bands in between (CH-CL). Up to 7.50-12.00 meters, the ground is sand-silt-clay (SM). In SK-7; Up to 1.50 meters from the surface, the ground is low-plasticity clay (CL). Between 1.50-1.95 meters the ground is SM group clay-silt-sand. Between 1.95-3.00 meters the ground is a clay-silt-sand mixture (SM). Between 3.00 and 7.50 meters, the ground is high plasticity clay predominantly (CH). Between 7.50-9.00 meters the ground is clay-silt-sand (SM) group. Between 9.00-9.45 meters the ground is low plasticity clay (CL). In SK-8; Up to 9.45 meters from the surface the ground is low plasticity clay predominantly CH-CL, with SM, ML ground levels in between. The study area generally presents differences in terms of water content in horizontal and vertical directions. In general, except for wells 7-8, it was observed that the groundwater content in all wells in the study area is between 0.00-3.00 m from the surface, above the plastic limit but closer to the plastic limit. It increases slightly at depths below 3.00 meters. In wells 7-8, the water content is generally closer to the plastic limit. Especially the part up to 4.00 meters from the surface gives much lower values and slightly higher values at depths below 4.00 meters.

CONCLUSION

The study area consists of alluvial units. Alluvial units consist of sediments formed at the end of the Pliocene and throughout the Quaternary. This stack, which is mostly clay, and silt, was observed as sandy clay in places. In our study area, the water level is at a depth of 2-3 m and the water sulfate concentration is high. The soil is generally composed of fine-grained silt-clay, silt-fine sand alternations. Within this unit, lens-shaped gravel-coarse sand transitions were observed. Although the soil in the study area is generally composed of CH, CL group clays, it was understood that CH group cohesive soil is more common. Fine sand lenses are observed in some locations. In some wells, instead of CH and CL group clay, SM, SP group clayey silt, sand, and gravel were observed. Since the soil water content is very close to the liquid limit values in the whole field and even has a water content above the liquid limit value in some parts, it was thought that the soil would generally exhibit soft or even liquid behavior. When the clay fraction and plasticity index of the samples were examined, it was understood that the clays were in the medium-high activity clay group, and the swelling potential showed medium-low swelling properties. This study is very important in terms of determining the soil group of the study area before planning and making plans following these soil groups, and directing the detailed soil survey studies desired for the superstructure and substructure plans to be constructed and for all kinds of engineering structures. In areas planned without determining the characteristics of the soil types, many losses occur, especially material losses, due to incorrect planning caused by the characteristics of the soil, especially different settlements. In order to prevent these material (economic) and moral (time, labor, etc. losses) and to realize more functional plans, determining the soil and parameters of the region is among the primary factors affecting the designs.

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