

URBAN GEOLOGY STUDIES

Conclusiton and Suggestions

1. Conclusions

The results from the IMM Urban Geology Project studies which aims to examine the basic geology characteristics of the 5461km² area of the province, determined by the law No. 5216 of Istanbul metropolis and to make large scaled geology maps for basis of the suitability of settlement are outlined below as a concise.

-A geological map of the area approximately 5.366 km² in total, of which 4.675 km² is 1/5,000 scaled within the scope of the Urban Geology Project and 691 km² is 1/2.000 scaled within the scope of the Microzonation projects, has been made on both sides of Istanbul.

-Correlation studies were made between the geological maps of different scales (1/5.000, 1/2.000) made at different times and by different teams, and 1/5.000 scaled geological maps were prepared, which will form the basis for the settlement suitability studies covering the entire province area.

-1/100,000 scaled Geological Map of Istanbul has been prepared by reducing the size of 1/5.000 scale geological maps and is given in the annex of this report. In the reduction studies, outcropping and structural elements that were too small to be seen on the 1/100,000-scale maps or that were too frequent to make the map difficult to read were cleanded, although they were included in the large-scale maps.

- With deep drilling for stratigraphic purposes, some rock-stratigraphic units, such as Pelitli Formation, and Yayalar Formation were found to be 370 m thick and 280-300 m thick respectively.

-The rock type features of the sequences exposed during outcropping and excavations, discontinuities as faults, joints, bedding, etc. were examined and visualized.

-All of the geological data have been digitized in the Geographic Information System.

-Regional faults originating from Permian, Late Cretaceous, Early Tertiary and Oligocene tectonic movements that were active in the province area, some of which extend across the province area and continue outside of the province borders, have been mapped by naming them.

-Field geology studies support the idea that the Şile-Sarıyer Fault is generally a strike-slip fault, but was deformed mostly by shearing and low-angle faulting developed in the N-direction within the strong compressional system in the N-S direction.

-From the drilling data carried out with field studies, it was deduced that the mass covering Aydos and Kurtköy formations, which formed the Camlica Hills, does not a clip (cone) feature, but was overthrust onto the Devonian age rock units by reverse faulting dipping 35° to the East.

- NE-SW and NW-SE trending conjugate faults with thrust and strike-slip faults, which are intensely seen in the region, did not affect the formations in the areas where they are covered by the outcrops of the Upper Miocene-Pliocene aged Sultanbeyli Formation; therefore, they do not have active fault characteristics.

- With the drilling conducted under the Microzoning Project covering Kadikoy-Tuzla in order to reveal the basal relief of the Sultanbeyli Formation, which contains Upper Miocene-Pliocene age terrestrial deposits, it has been proven that this formation was deposited in the high relief tectonic pit confined by faults in NW-SE, NE-SW directions that was active during its deposition.

- It has been determined that the faults observed during the temporary foundation excavations in the Çekmece Formation and the drillings have been done within the scope of the Microzoning Project also affected the European side of the Late Miocene-Pliocene extensional regime.

-In the samples collected from various members of the Pelitli and Denizli Köyü formations, age determinations based on the conodont content were made, and the ages at the layer level of Silurian and especially Devonian systems were obtained.

-In the geology maps published by the MTA General Directorate of 1/50,000 scale, the Sultanbeyli Formation, which is determined as terrestrial depositions mapped with the names of Mesetepe and Kayalitepe formation at Oligosen-Alt Miyosen age, was interpreted by base relief and the palynological age determination of the core samples taken from this unit.

-Age designations in C14 method from charred plant particles taken from drilling cores carried out under the Microzoning Project on the level where the Kucuksu creek is reunited to the Bosphorus has been done. The Holocene age of the Kuşdili Formation was based on the age determination made by C14 method for the first time.

- General geohydraulic and hydrogeological features of the study area, permeability of rockstratigraphy units, dam, stream, spring, fountain, surface water resources data information are given in the report.

-Considering the dominant rock-type characteristics of the rock-stratigraphic units, general features in terms of engineering geology were tried to be specified. The rock-stratigraphic units of the province area are determined as "Rock", "Soil" and "Soil-Like" (soft) units in terms of their engineering properties.

-The rock-stratigraphy units formed in the Paleozoic-Quaternary age outcropping in the province area have been examined in terms of their general permeability properties by dividing them into 4 classes as impermeable (Gz), semi-impermeable (GZ), semi-permeable (impact) and permeable (Gç).

- Within the scope of the Microzonation Projects, geophysical studies have been carried out in a total of 691 km² on the European and Anatolian sides of the area, which has been geologically mapped, in order to provide input to the efforts to determine soil-dependent deterministic ground motion. Since the data and interpretations obtained from these studies fall within the scope of a separate report, the data related to the seismic properties of the rock units are specifically mentioned in this report.

-The coastal part of Marmara between Küçükçekmece and Büyükçekmece lakes and the eastern slopes of Büyükçekmece bay are almost completely covered by landslides. Most of the landslide areas were developed in the regions where claystones of the Gürpınar and Güngören members, which are impermeable, resistant to weathering and have low shear resistance, are overlaid by the Kıraç Member, which has high water carrying capacity and is more resistant to abrasion. In addition to the active landslides, there are also paleo landslides that developed in a different topography, especially during the glacial period when the sea level was about 100 meters lower than today.

2. Suggestions

-In these studies, conducted under IBB DEZİM Kent geology and Microzoning projects, detailed geological examinations were not carried out except in some cases necessary, as they were limited to project purposes, but were intended to produce the basic geological maps that were deficient for urban and localization studies. Detailed surface and subsurface geological data and geology maps from these studies are the leading source of data for detailed scientific

research in various branches of the geology. These studies have made it clear that the area and the nearby area of Istanbul, which are particularly important for the geological development of the Marmara basin, have much more complex and interesting geological features in the present and that thorough scientific research is necessary to solve problems. For example;

1. Many of the Istanbul Union's Paleozoic old rock stratigraphy units, which are transverse and vertical transition with each other, have not been seen in the expected stratigraphic positions in some regions, and in many previous studies, have been tried to be explained by the use of the faults without regarding facies and rock type differences. This assumption has given geology maps a difficult, complex look to interpret.

2. The Type Section and/or Type placements, most of the rock-stratigraphy units transferred from previous studies, do not contain coordinate information. Providing this and similar naming data, which is required for the naming rules, requires detailed stratigraphic review of this.

3. The nature of the relationship between the Metamorphoses of the Istranca Union and the Istanbul Union rock units, which have been side-by-side with an important tectonic movement, should be discussed. In particular, the nature of the tectonic movement, which has brought together these two contingents, which have a significant difference in metamorphism, has not yet been fully clarified. Detailed structural inspections must be carried out to reveal the characteristics of these movements, especially on the Anatolian side, and the province area, which has been significantly affected by the Permian, late Cretaceous, early Tertiary and Oligocene movements.

4. The İstanbul, Çekmece and Sultanbeyli formations are of special importance in understanding the Miocene-Pliocene movements that deeply affected the Marmara region and some of which continued until the Holocene.

5. The Kıraç Member of the İstanbul Formation and the Çukurçeşme Member of the Çekmece Formation were assumed to be a single unit with the name of the Çukurçeşme Formation or the Ergene Formation in most previous studies. In recent years, studies involving the author of this report have been asserted that there are significant separations in terms of age and environment between the two units. By examining the relationship between these two units in detail, important clues can be obtained regarding the Lower-Middle Miocene peneplainization movement.

6. In the samples selected from the felsic tuff and tuffite levels, which are seen as intercalations and lenses at different levels of the Oligocene-Lower Miocene sediments, in potassium mineral concentrates (for example, in sanidines), radiometric age determination by K-Ar method will contribute to the efforts to illuminate the stratigraphy and tectonic development associated with this process.

7. A sufficiently detailed paleontological examination of the lower and upper age limits of the Çekmece Formation, which is known to be of Upper Miocene-Pliocene age, has not been carried out until today. Efforts should be made to eliminate this deficiency with detailed palynological examinations.

8. The coastal part of the Marmara Sea between Küçükçekmece and Büyükçekmece lakes and the eastern slopes of Büyükçekmece Bay have landslides almost entirely. These landslides, some of which are dormant, can become active due to unconscious excavation and wrong construction site selection. The landslide area has remained in the area of intense construction today. After this stage, the aim of the landslide field studies to be carried out in the region should be to determine the active, fossil and dormant landslides in detail and to find clues that will shed light on the measures to be taken to prevent the stability of such landslides.