J. Appl. Environ. Biol. Sci., 1(9)366-369, 2011

ISSN: 2090-4274
Journal of Applied Environmental and Biological Sciences
www.textroad.com

Environment, Geography & Geology of Tehran

Amir Hossein Farhadian

Faculty of Geology & Geography, Yerevan state university, Armenia

ABSTRACT

Tehran Metropolitan Area, the capital of Iran is located on the skirt of the Alborz Mountain which form a part of the Anatoly Orogenic belt with high range of earthquake potential. Urbanization in Tehran has been increasing during these years. Drawing of environmental plans for the city plays a vital tool for planner and decision maker to reduce subsurface investigations and serve as a basis to assess geo-environmental impacts. In this research, physical and mechanical characteristics of the quaternary deposits of Tehran city are assessed. In this regard, a large amount of geotechnical information derived from too many cores was collected and analyzed. The combinations of the collected geotechnical data has led to the compilation of several engineering geological maps and cross sections for the area. Practical applications of the study include preparation of maps showing the presumed allowable bearing pressures under static loading for preliminary design purposes of foundations.

Key words: Tehran, Environment, Geography.

INTRODUCTION

The city of Tehran is founded on Quaternary alluvium, which has been geologically classified by Rieben. The city is located at the foot of the Alborz Mountain Range, which is basically composed of Eocene pyroclastic deposits (green tuff) and other volcanic rocks. The geology and the morphology of the Tehran region is similar to that for other cities located at the foot of mountains.

Rieben divided the Tehran alluvia into four categories, identified as A, B, C and D (from oldest to youngest). In the Rieben geological classification system, which is widely used in Iran, the age and general geological characteristics of alluvia are considered, rather than engineering properties. The Rieben and other geological classification systems are described in this paper and geological factors that affect the geotechnical characterization of the Tehran alluvium are discussed. Because of the nature of the Tehran soils, undisturbed samples for laboratory testing are difficult to obtain and the execution of large-scale *in situ* tests is difficult, expensive and not practical for the majority of construction sites. Accordingly, a geological–geotechnical classification system is required to assess the engineering properties of coarse-grained soils for use in small to medium-sized construction projects. To determine the geotechnical properties of the Tehran alluvia, a number of *in situ* tests have been undertaken. The test results have been compared with published research results and the Rieben classification system has been extended to cover geotechnical properties. A similar framework could be used to create local geotechnical–geological classification systems of other coarse alluvia in other locations(1).

The unbalanced distribution of population is also observable beyond Tehran's borders as well. Between the less populous mountainous area to the north and the desert rim areas, with a population of less than one pph, to the south, population concentration is greater in the mountain's base. Except the Varamin plain and specially in the southern part of Tehran, where agricultural activities have become marginal and where villages have become cities indeed, agricultural areas have remained very thinly populated (between 1-3 pph). Suburbs have often taken shape without a plan. They have developed on arable lands that are restricted by law to be used for building construction. Much of such land has turned into cities such as Qarchak (212 pph) or Akbarâbâd (825 pph). The situation in Eslamshahr (81 pph) or Karaj (49 pph) is better because their urban development was quickly brought under control. In 1970, Tehran had a population of 3 million (10 per cent of the country's population). In 1987, the city had grown to more than 7 million people and covered an area of 575 sq km according to the Studies and Planning Organization of the City of Tehran (SPOT, 1987).

In 2000, its population was probably close to or exceeding 9 million (Saitama University, 2000) and its metropolitan area was spread over 1,700+ sq km or three times the area it occupied 13 years before (SPOT, 1987). The population of Tehran had grown 51 times during the 120 years from 1861-1981 as a result of government policies that were intended to make the city larger and stronger. In the past decade the government's policies were reversed and the Republic was intent on keeping the growth of all of its cities in check.

***Correspondence Author:** Amir Hossein Farhadian, Faculty of Geology & Geography, Yerevan state university, Armenia.
Email: amirhossein.farhadian@yahoo.com

The growth of Tehran had slowed from 5.2 per cent in 1970-75 to 1.5 per cent in 1990-95 due to effective policies implemented by the Republic (UNDP, 1996; WRI, 1998). These included tax and housing incentives that encouraged people to move out of the central part of the city as well as the development of many New Towns on the fringes of the Tehran Metropolitan Region(1, 2).

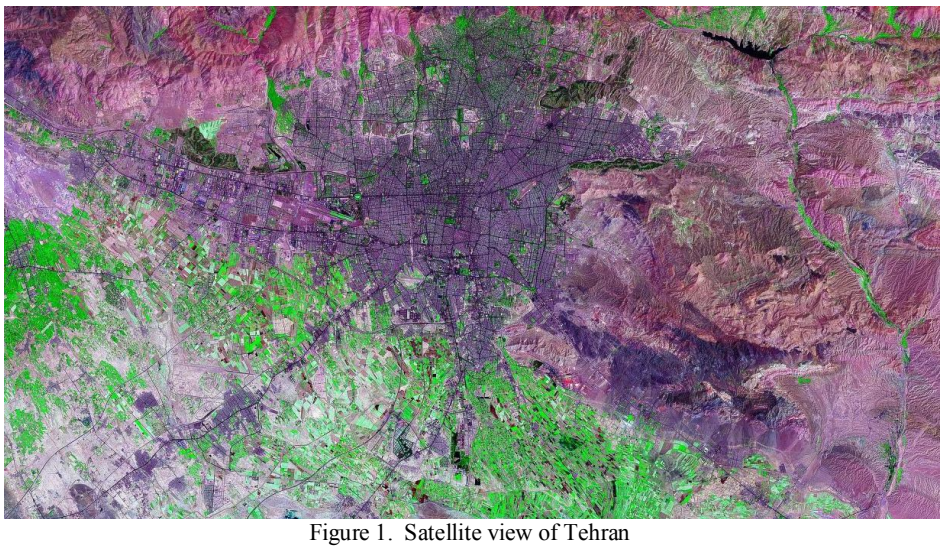

Figure 1. Satellite view of Tehran

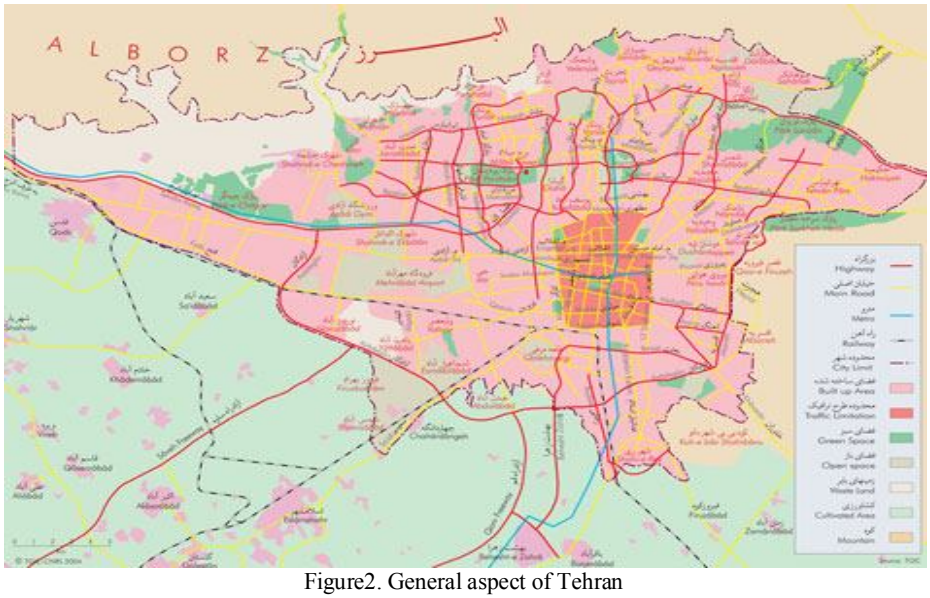

Figure2. General aspect of Tehran

Geographical & Environmental peculiarities

Environmentally speaking, the climate of Tehran province in the southern areas is warm and dry, but in the mountain vicinity is cold and semi-humid, and in the higher regions is cold with long winters. The hottest months of the year are from mid-July to mid-September when temperatures range from 28°-30°C and the coldest months experience 1°C around December–January, but at certain times in winter it can reach -15°C. Tehran city has moderate winters and hot summers. Average annual rainfall is approximately 200 mm, the maximum being during the winter season. On the whole the province has a semi arid, steppe climate in the south and an alpine climate in the north. Tehran is located on the southern slopes of Alborz, and in approximately equal distance from eastern (Afghanistan) and western (Turkey, Iraq) borders, sitting on the ancient and famous City of Rey. Tabriz and Mashhad are respectively 550 and 750 kilometers away. Tehran is not far from Khazar (Caspian Sea) with an aerial distance of 100 kilometers. However Alborz and Emâmzâdeh Hâshem passes, with an altitude of more than 2700

meters, must be overtaken on the way from Tehran to Mâzandarân to reach the Sea. Environmentally speaking, the climate of Tehran province in the southern areas is warm and dry, but in the mountain vicinity is cold and semi-humid, and in the higher regions is cold with long winters. The hottest months of the year are from mid-July to mid-September when temperatures range from 28°-30°C and the coldest months experience 1°C around December–January, but at certain times in winter it can reach -15°C. Tehran city has moderate winters and hot summers. Average annual rainfall is approximately 200 mm, the maximum being during the winter season. On the whole the province has a semi arid, steppe climate in the south and an alpine climate in the north.

Multiple aqueducts bring the water to surface that, in turn, flows through irrigation canals and brooks along all streets and avenues of Tehran and many other towns and cities within the province. No sizeable river passes through this province's towns, other than Karaj. In higher parts of the slope, i.e. over 1500 m, it becomes cooler while major water resources in the area have provided for the development of big and arborous (mainly poplar and fruiters) villages.

Lower part, between 900 to 1200 m, have a fertile soil and a gentle slope that permit a productive agricultural activity. In these plains, there are many sources of surface or underground water tables, supplied by aqueducts, flood ways and branched out rivers.

In the south of Tehran and its suburbs, beyond the new airport, the desert begins. Dry and very hot weather in summer and sometimes very cold in winter, make this region seem hostile, although this open and bare space plays the role of a strategic reserve space for Tehran Metropolis and its 12 million inhabitants.

On the policy agenda of the concept of sustainability is to maintain an acceptable quality of life for all. Though it is increasingly difficult to distinguish between industrialization and urbanization impacts on the environment (Marcotullio, 2001) - urbanization itself a part of the development process - creates both challenges and opportunities. Main challenge is to manage the process so as to avoid a severe deterioration in the quality of life. Sustainable development intends to ensure a better quality of life for all, now and for generations to come and achieving social, economic and environmental objectives at the same time.

Water supply

In its early years, the city's water supply was collected by 115 km of major canals and natural rivers as well as a series of small open channels, all fed from small streams draining southward from their sources in the Alborz Mountains. However, by the 1960-1970s, many wells had been drilled in the Qum basin. The early developments were highly successful and more than 40 wells had an average yield of 400 gallons per minutes (gpm) (Bierschenk and Wilson, 1960). Some wells yielded more than 1000 gpm. The depth of most wells was approximately 40 metres. By 1998, more than 261 deep wells had been drilled that provided 40 per cent of Tehran's drinking water. Sixty per cent was provided by the Karaj, Latian and Lar dams. The city grew rapidly in the 1990s and the demand for water increased dramatically. In the winter of 1998 and the spring of 1999, the rainfall was deficient creating the worst water crisis seen in the city in 100 years. These were strong indications that Tehran would eventually face a severe continuing water shortage as its population grew(3, 5, 7).

The first water problems appeared in 1992 when the demand for drinking water rose to 360 million cubic metres. Plans were drawn up to increase the supply to 725 million cubic metres. The Tehran Regional Water Organization planned three new projects that would utilize an additional 310 million cubic metres/yr. These projects were located in the following areas: Imam Khomeini airport (30 million cubic metres), Imam Khomeini shrine (30 million cubic metres), Varamin plain (150 million cubic metres and Rabat-Karim plain (100 million cubic metres) (Mojjed and Hariri, 1999). The Tehran Water Organization indicated that in 1999 the three dams would yield 570 million cubic metres and that groundwater would yield an additional 500 million cubic metres. However, because of inadequate rainfall in 1998-1999 groundwater recharge was much reduced. The city residents were asked to reduce their consumption by 10 per cent(4,5,6)).

In the 2000s, the city would also take additional measures to conserve water as follows: drill 50 new wells to supply an addition 3.5 cubic metres per second of water, create new reservoirs, develop 37.9 km of distribution networks, renovate 134 km of old networks, replace aging equipment, cut down on illegal tapping of water, lower the usage of water in city parks and reduce water waste in industries (Mojjed et al., 1999).

CONCLUSION AND DISCUSSION

Throughout the last two centuries Tehran has faced rapid urban growth. This rapid growth has led to unplanned urban development, causing major environmental problems and a severe lack of human contact with nature. It is therefore crucial to devise a comprehensive urban plan with a new landscape ecology approach to bring nature back to the human realm for the future development of the city.

A major issue interrelated with unplanned urban sprawl within the urban area of Tehran is the lack of ecological integrity and an increasing distance between people and natural phenomena.

Cities in less developed countries are growing much faster than the capacity of authorities to cope. Technologies of industrial countries are not always suited or easily adaptable to the socio-economic and environmental conditions of developing countries.

For some countries – more and less developed - globalization has set the context for development and urban environmental and social conditions are strongly linked to regional and global economic and social flows (Marcotullio, 2001), though this is not the case for all. However, these issues must be included in any attempt to assess or analyze sustainability.

Because the response should improve the general status of the environment in the coming years the constant monitoring of parameters such as pressure state and response and the political effects and responses which have been used formerly for improvement of the state of the environment can be studied and analyzed.

REFERENCES

1) Aminzadeh, B. and Khansefid, M. (2010). Improving the Natural and Built Ecological Systems in an Urban Environment. Int. J. Environ. Res., **4 (2)**, 361-372.
2) Bahrainy, S. H. and Tabibian, M. (1999). A model for evaluation of urban environmental quality. Journal of Environmental studies, **24 (21&22)**, 41-56.
3) Bartelmus, P. (2008). Indicators of sustainable development, Encyclopaedia of Earth (EOE). Retrieved November 30, 2010, from http://www.eoearth.org/article/Indicators of sustainable development.
4) Faryadi, Sh. and Taheri, Sh. (2009). Interconnections of urban green spaces and environmental quality of Tehran. Int. J.Environ. Res., **3 (2)**, 199-208.
5) TSY, (2006). Tehran's statistics yearbook, Statistical center of Iran. SCI, Tehran, Iran.
6) Seifollahi, M. (2009). Evaluation of environmental quality of the city of Tehran, based on the model of urban sustainable Indices and formulation of improving strategies. Thesis, University of Tehran.
7) Ziari, K. and Gharakhlou, M. (2009). A Study of Iranian New Towns During Pre and Post Revolution. Int. J. Environ. Res., **3 (1)**, 143-154.
8) Tehran Muncipality, Public & International Relations Department, (2011).