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APPRAISEMENT OF THE GEOLOGIC FEATURES AS A GEO-HERITAGE IN ABU-ROASH AREA, CAIRO- EGYPT

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ABSTRACT

Egypt contains Geologic Heritage that create much opportunity to develop educational and recreational programs as well as tourism projects. Enhancement of Geologic Heritage and awareness of the importance of Geologic Heritage is a great challenge. This paper focuses on a neglected area inside Cairo that is facing a great destruction from the people living there. The Abu-Roash archaeological site is located at 31° 02′ 42″ E longitude and 30° 02′ 42″ N latitude. It is one of the most important areas for education and scientific study inside Cairo. Although the area is not suited as a geo-heritage or even a protected area, it contains Cretaceous to upper Eocene sedimentary beds and fossils, and a great variety of structural features. Not only an important geologic aspect found in the area but also an archeological site is present which provide the area of a great scientific, cultural/historical, aesthetic and/or social/economic value. These different criteria qualifies the study are to have a regional/provincial rank for its Geo-heritage. Abu Roash area are possess good geo-diversity, geo abundance and geo richness which lead us to start point for establishing potential *geo-heritage* that should be conserved the area also need to be recognized as a geological conservation sites, the area should be Stated as a protected area of a heritage legislation to protect geo-heritage.

1. INTRODUCTION

In the most recent few decades, there emerged another pattern for protection and management of geologic offers through worldwide association. In 1972, the all gathering for UNESCO received the convention concerning those security of the universe social and common heritage" [1]. This gathering gives those definition about two sorts from claiming heritage, the place "…natural legacy will be characterized similarly as those complex about bio-ecological and geomorphological components of nature deserving about protection. This twofold point of view may be additionally recognized at authoritative level, notably Toward those first parts of the EU directive 92/43, and during experimental level Toward the endeavors will join geomorphology Furthermore nature [2,3]. Geo- heritage evaluation arised in the recent years with growing importance, leading to a place for geodiversity concepts alongside biodiversity [4-11].

The assessment study on the topic geoheritage are recent studies but this type of studies is fast growing and depend on quantitative methods [4,6]. Geological features are presenting different contents which displaying variable heritage values, depending on the meaning that we attribute to them. As pointed by a scientist, the diversity of contents and the different protection criteria leads to the existence of a great variety of legal regulations [12-14]. As a result, the geological heritage of the planet is irregularly protected all over the world, and objects with different contents may be or not at risk, depending on a wide range of factors, most of them not related with its contents.

The term geoheritage is not applied widely in Egypt, although there are many valuable geologic areas. The area of Abu-Roash represents a unique and easily accessible geologic feature. Unfortunately, the area is not currently monitored by a geologic organization as a geoheritage place or even not recorded as a protected area.

2. GEOLOGIC SETTING FOR ABU-ROASH AREA

Abu Roash constitutes a complex Cretaceous sedimentary succession with outstanding tectonic features. The area lies on the edge of the western desert, west of Cairo, Egypt (figure 1), at distance of 9 km north of the great pyramid of Giza. Its name is derived from the neighboring village of Abu-Roash.

The Abu-Roash area is within the western end of the Syrian-arc folds of which extends from northern Egypt to Syria [13]. The upper Cretaceous rocks in the northwestern desert of Egypt underwent many different tectonic regimes since Paleozoic time. These regimes caused the formation of many sub-basins, ridges, trenches and platforms. The exposed lithostratigraphic sequence of the area includes Cretaceous, Middle and Upper Eocene, Oligocene, and Quaternary rock units. The units in the following ascending order; Sandstone series, Rudista series, Limestone series,Acteonella series, Flint series, Pilcatula series, Chalk- Maddi Formation, Sands, and Basalt and Gravel terraces and alluvial deposits The Abu Roash Massif is also characterized by heterogeneous fold styles with different directions [14-17]. The folds are plunging anticlines and synclines oriented In a NE-SW direction. The northeast trending folds of the area resulted from the combination of compressional stresses initiated from wrenching in addition to arching of the basement. These folds are believed to have developed during the Late Cretaceous - Early Eocene time. The Cretaceous tectonics were severe to the degree that in many parts of Egypt they formulate the present day structurally related land forms [18]. Among the latter, some domal structures were selected by the petroleum industry to test by drilling like what found in Abu Roash area [19].

The major structural elements in Abu Roash area are folding and faulting. These structural elements reflect the structural pattern of the north-Western Desert that are hidden below the younger sediments. These structures were developed during the late Cretaceous and characterized by compression tectonic regime. Besides the folds, faults are extensively developed in specific directions: The E- W, the ENE and WNW trending faults are the masters with almost a dextral-sense of movement, while those of NW trend are normals. N-S, NNE and NNW sinistral-slip faul ts and NE thrusts are subordinately developed [20-23]. The en echelon arrangement of both folds and faults in addition to the restriction of deformation in

certain narrow belts; weak development of the conjugate sinistral-slip faults and conspicuous rotation of the structural elements indicate a dextral shear-couple. Such a regime principally prevailed with little convergence along the ENE master faults, and divergence along the EW wrenches.
Folds in Abu-Roash are the most important structural elements that played a major role in the deformational history of the area [24]. A series of anticlines and synclines are recognized obviously in the area, folds range from 100 m to 0.5 km in width and from 300 m to 2.5 km in length. They are disturbed by longitudinal and reverse faults [25]. Some folds are open and form symmetrical structures, whereas others are rather complicated, asymmetric, plunging. Besides the individual folds, there are domal structure (El-Hassana dome and El Ghigiga dome)

3. GEO-SITES IN ABU-ROASH

Abu Roash area is one of the most interesting sites inside Cairo, with important geologic features that could be investigated easily [26,27]. This area is used as the main field trip locale for students in University (geology, geography and Archaeology) since the 1980s, which indicates how valuable the area is and that the area is used for; scientific, educational and archaeological purposes.

The area contains the following types of geo-sites;

a- Stratigraphic type: the area consists of different stratigraphic sequences that include Cretaceous and upper to middle Eocene strata (figure 2)
b- Structure type: the area consists of folds, faults, unconformities, and domal structures. (figure 3-8)
c- Economical type: the area is considered one of the important places for chalk quarries in Cairo. There are 4 quarries inside of the Abu Roash area (Figures 9a & b)
d- Paleontological type: there are different types of fossils are well preserved within the sedimentary succession at Abu Roash (figures 10a-d). Ph. Colelntrata (Anthoozoa), Ph. Porifera, Ph Mollusca (Gastropoda and Bivalivia) , Ph. Echinodermata, These fossil collection include rudists and echinoidea that reflect open marine conditions. Rudist fragments in some strata were reworked from the rudist biostrome and re-deposited in quiet, deep subtidal conditions.
e- Sedimentary type: The snow-white chalky limestone. This Chalk was deposited under open marine, outer shelf environmental conditions as mentioned from Issawi et al., (2009), are of great interest because such rocks are rare in the geological record. And rare to be found inside Cairo it was recorded in Bahariya oasis 500 Km from Cairo (Figures 11& 12).
f- Igneous type: Tertiary age basalt is found in the Abu Roash area.
g- Archaeological site: Old pyramid, sculpted in chalky limestone, known of the 4th lost pyramid in Egypt. (Figures 13 & 14).

4. DISCUSSION

The rank of geologic heritage in the Abu Roash area according to the classification of Ruban and Kuo. The typology of the area is; Stratigraphical, paleonotical, sedimentary, Igneous, economical, Structural, Paleogeographical, geomorphological, geohistrocal [28]. Which indicate a diversity in the geosites in this area, makes the area ranking from low to moderate in its geologic heritage. And according to the typology of the area contain different facies according to the geologic age recorded in the area from the upper createous which represented in the Chalk facie –Eocene represented in Shallow marine (bivalaves,, nummulites) [29-31].

This is one of the unique cases that the archaeological sites are linked with the geological sites represented in the area in an old pyramid for the ancient Egyptian, the area needs good understanding to support a correct assessments of geological heritage value, geo-conservation and geo-tourism planning. Although the great importance of the area it is treated with caution.

After calculating the geodiversity index, for Abu-Roash area, the linear scale is 0.55 which indicate that the area ranked as Regional/provincial in its geosite importance [32].
"stated two types of geomophosite;
(i) a geomorphosite is a landform to which a value can be attributed;
(ii) a geomorphological resource is a geomorphosite that can be used by society.
The attributes that may confer value to a geomorphosite are: scenic; socio-economic; cultural; scientific. The scenic (aesthetic) criterion is to a great extent, of an intuitive nature. In this case, the approach to Nature depends upon the individual contemplating it and his/her state of mind at the time. It is derived from feelings which, being personal perceptions, are highly subjective, it is therefore difficult to value and compare with the feelings and perceptions of others".
In Abo-Roash area can be classified as a type (i) geomorphosite and a geomorphological resource (ii) which can be used by society, where the area contains both unique landforms and used for scio-ecnomic, culture, and scientific study.

5. CONCLUSION

The geologic heritage of Abu Roash is of regional/provincial rank where the area represents geodiversity, geoabundance and georichness in its geo-heritage. The area is not currently recorded as a geoheritage site or protected area. The only place recorded as a protected area is the Domal Structure (El Hassan dome), while the aforementioned folds, fossils, and facies are not being monitored by the country, thus there is a high probability of losing Abu Roash as a geoheritage site. Thus, it would be desirable to put this area under control from a specialized organization to save the geologic heritage.
Also, the area should be:

- Stated as a protected area of geo- heritage legislation that directly protects its geo and archeological heritage.
- Vulnerability assessment should also identify tenure status.
- An expert working groups should achieve enhanced and practical protection approaches for the geosites.

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Figures Captions:

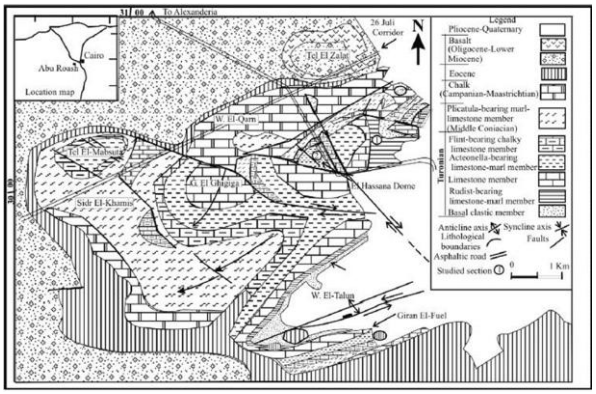

Figure 1a: Geologic map of Abu-Roash area (after Abu Khadra et al, 2005).

Figure 1b: Location map for Au-Roash area.

Figure 2: Accessible road in the entrance to the of Abu-Roash area, open fold with different facies appear also recognize.

Figure 3: Plunged fold consisting of different beds from ferruginous sandstone and chalky limestone.

Figure 4a and b: Over view for the area, showings the anticline and syncline folds with alternative beds of sandstone and limestone. S, sinkholes also appear in the folded strata.

Figure 5: Symmetrical and unsymmetrical folds Varieties of folds are obvious (symmetrical and unsymmetrical folds) appear in this area.

Figure 6: Tilted chalk limestone beds (Eocene) as they occur in Abu Roash., The human impact is clear in this photo with garbage dumped within the Abu Roash area. Where they used this area to throw their garbage.

Figure 7: An angular unconformity is clearly shown clear unconformity between tilted and horizontal beds and horizontal one.

Figure 8a: El- Hassana Dome, (domal structure) near the end of the Abu Roash Aburoash area and the end of the deformation, this dome is currently within recorded as a protected area.

Figure 8b: The core of El Hassana Dome.

Figure 9a and b: Limestone quarries in the area.

Figure 10: Different fossils record different facies and geologic ages in the Abu Roash area:

a- nummilites gizahensis (, Eocene), b & c rudist bivalves, d- Rudist rudist bearing limestone (after Abdel-Gawad et al, 2011). A,b, and c are samples of fossils were collected during a field trip with students.

Figure 11 & 12: The snow-white chalky limestones in Abou-Roash area.

Figure 13: The lost pyramid, the Djedefre pyramid. The remaining blocks of the Pyramid.

Figure 14: Inside the pyramid.