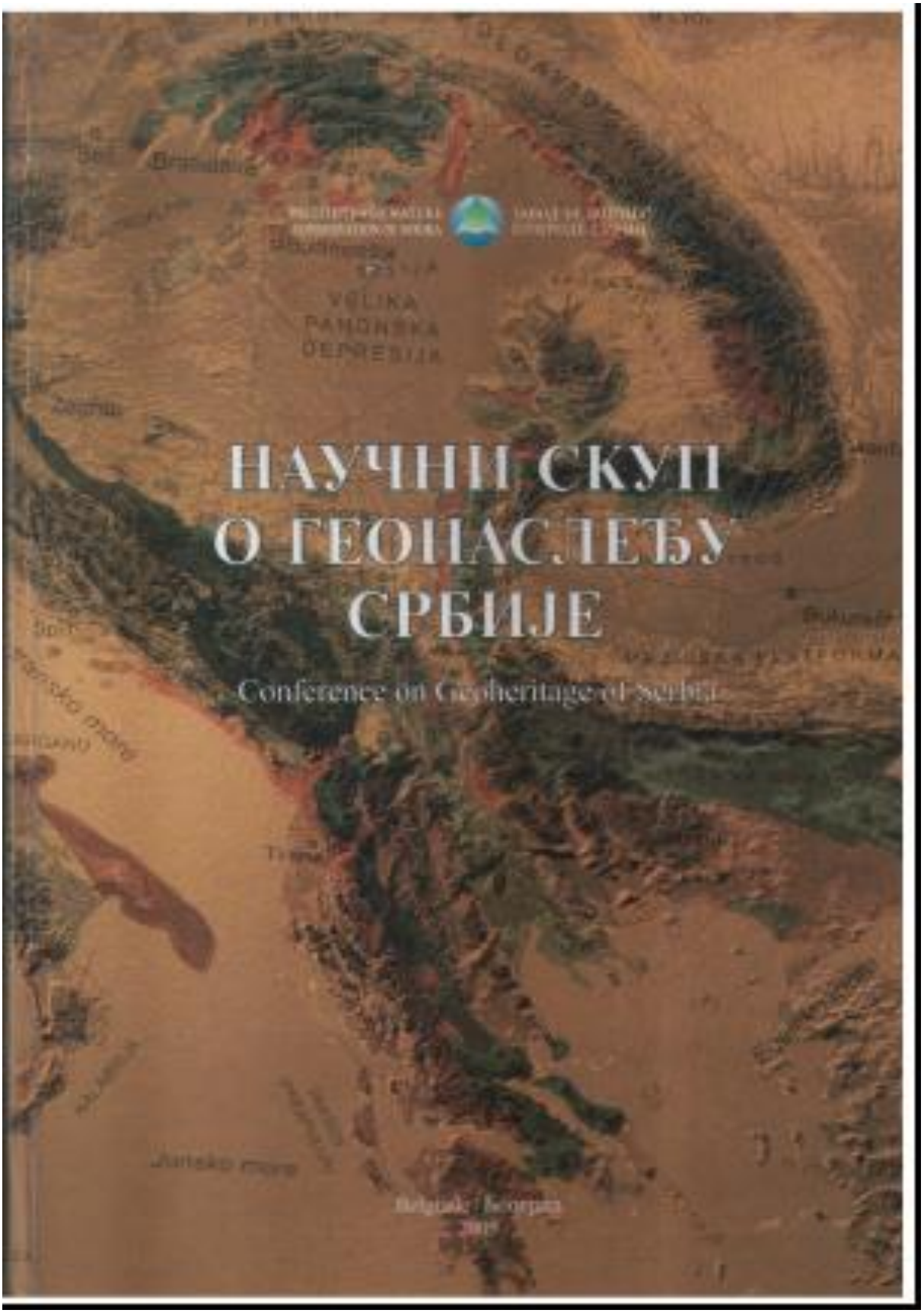

НАУЧНИ СКУП О ГЕОНАСЛЕЂУ СРБИЈЕ

Conference on Geoheritage of Serbia

ЗАВОД ЗА ЗАШТИТУ ПРИРОДЕ СРБИЈЕ
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BASIC THREATS ON GEOSITES AND GEOHERITAGES IN TURKEY

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Abstract: An investigation have been carried out using the national inventory list of Turkey to display urgent threats on Turkish geosites. It is surprising to differ that main threat on geosites, particularly those with fine elements o (leaf, teeth and fish fossils, shiny rocks and crystals) was excursions of geology students, fieldtrips of geologists, geotouriats, collectionists. Rate of these types of destruction is so fast that some localities disappeared just after its discovery. It takes e. five years. Mining and road construction are other important threats. It is pity that local people and even authorities did not take any care of geosite protection if the visitor is an earthscientist or geology student. Education of local people seems to be first measure, however it is not so easy.

Keywords: *Turkey, geosite, threats, threat distribution*

Извод: У циљу указивања на угроженост геолошких објеката у Турској вршени су истраживања објеката према националном инвентару. Изнолаўује закључак да су објекти геонаслеђа, нарочито они који садрже ситне елементе (лишће, зубе и фосили риба, сјајне стене и кристале), већином били угрожени од стране студената геологије на екскурзијама или теренском обиласку геолога, геотуриста, колекционара. Степен овакве врсте угрожености толико брзо расте да су неки налазишта нестала чим су била откривена и то у року од око пет година. Други значајни уврочници угрожености су градиште и изградња путева. Жалосно је да локално становништво, па чак и власти нису ништа предузели да заштите објекте геонаслеђа од посетилаца и студената геологије. Изгледа да је прва мера коју треба предузети образовање људи, али то није тако лако.

Кључне речи: *Турска, објекати геонаслеђа, угроженосій, расйодела угрожеиосйи*

Introduction

Turkey is a southeastern European country forming a geographical, historical and geological bridge between Europe and Asia (Fig. 1). It has two large terrains called as Trachia and Anatolia that are separated by straits of Istanbul (Bosphorous) and Canakkale (Dardanelle). Turkey covers a lot of excellent geosites and geoheritages, however majority of them is under threat of destruction by various effects (Kazancı *et al.*, 2004). This paper intends to give a summary about destruction causes of natural monuments in Turkey.

A geosite is a natural document which explain geological processes of the past. Destruction or dissappearance of a geosite would give rise to be in dark forever the local or regional natural history (i.e. Digne Declaration, 1991; *in* www.progeo.org.se, also see Parkes, 2004, p. 323–328 for subsequent declarations).

Rocks, minerals and fossils are the archives of the history of our planet and the history of life itself. They are evidence of the passage of geological time, revealing the changes that have shaped the Earth's surface over millions of years. These archives make it possible for us to understand the way our planet looks today and the diversity of its fauna and flora. As with archaeological artefacts, geological sites, minerals and fossils are vulnerable and are a non-renewable heritage that belongs to humanity. Human society interacts with geology and geomorphology in many ways. Through direct exploitation of mineral resources, through reshaping the landscape by industrial or agricultural activity, by the development of infrastructure links. In some cases (for example by quarrying, mining, cutting of new roads) these activities reveal geological or geomorphological information of scientific, educational or cultural value. In other ways our activity destroys this information. Re-

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moval of glacial landforms for use as building material, armouring (and obscuring) of rock sections on coasts, infilling of old quarries with waste, are all examples of destructive activities (CO-DBP, 2003; Parkes, 2004). As result, threats on geosites are a general problem for all of us, not only local inhabitants. Contrary to this general idea, the abundance of cultural sites and the richness of biodiversity have resulted ignoring the real measures in Turkey on protection of natural monuments, particularly the geological heritage (Kazancı *et al.*, 2004; Kazancı *et al.*, *in press*). It is possible to say that a good deal of geosites have been destroying by different human activities i.e. urbanism, construction, mining, combined with natural events like landslides, floods and weathering. The aim of this study is grouping and/or qualifying the present threats on geosites and geoheritages of Turkey.

Fig. 1. Location of Turkey between Asia and Europe
Сл. 1. Положај Турске између Азије и Европе

Tectonic outlines of Turkey

Anatolia, the Asian part of Turkey where occured typical sections of Alp-Hymalayan system, has a geological history broadly parallel to the story of Tethys ocean. Signals and results of openings and closures of both Paleotethys and Neotethys oceans, rock records by marginal seas, suture zones, crust obductions with related metamorphisms and volcanisms can be observed in Turkey representing different time periods. It is worth to note that some localities and their rocks of Antecambrian and Palaeozoic show primary textures and structures as they had been escaped from tectonism and metamorphism in spite of extensive block movements in the country during the Palaeozoic and later on. Thanks to these outcrops, the northern margin of Gondwanaland and the southmost margin of the continent Eurasia in the Palaeozoic could be delineated apparently. Mesozoic and early Tertiary were the periods of hegemonia of the Tethys ocean in Anatolia. The Miocene was the critical period where a continent-scale collision reached to paroxism terminating the palaeotectonic regime of Turkey. In other word the neotectonic regime of the country has begun by this collision.

Since Miocene Turkey has been still deforming by effects of the continental collision resulting some active tectonic structures in Anatolia. The North Anatolian Fault, a right-lateral, 1400 km-long, seismicaly active transform fracture is one of the largest representatives of the mentioned deformation (Fig. 2). This fault also forms a boundary between blocks of Anatolia and Eurasia and many structural depositional basins and related successions have been formed along this fault (Fig. 2). Neogene and Quaternary grabens in western Anatolia are results of neotectonic regime and they were occupied extensively by people and towns, although seismic activity of these areas create severe risk for inhabitants.

The complex or rich geology of Turkey provides a large potential for geosites and geo-heritages, but unfortunately limited number of them could be registered (www.jemirko.org.tr) according to merit ProGeo's categorisation (e.g. Wimbledon, 1996; Drandaki et al, 2004). Morever, they are in shadow of abundance of cultural sites in the country (Kazancı *et al.*, *in press*).

Fig. 2. Simplified active tectonic map of Aegean region and western Turkey
Сл. 2. Упрошћена карта тектонски активног егејског региона и западне Турске.

Method of Study

Geosites in Turkey are under threat of destruction by varying effects from natural erosion to geocollection, from tourism to mining as mentioned above. However, there is not any systematic research for type, intensivity and rate of destruction of geosites so far. This study is an inventorial research or a case study realized by re-investigation of registration proposal forms which were submitted to JEMIRKO by individuals or a group of earthscientists in order to describe the relevant geosites.

The number of proposal forms used for this study is 137 (see the complete list in www.jemirko.org.tr). In order to eliminate misunderstanding, meanings of the terms used in the research are as follows;

Threat: A potential agent for destruction. Sometime it has began to work on geosites.

Destruction: Partly or complete destroy of a geosite by various effects included natural ones as well.

Destruction Rate: A time interval of destruction of a geosite from first description or proposition for inventory. It may correspond to a life of a geoheritage.

Results

The obtained results by this study are highly surprising as they are against to classical beliefs. For instance, the investigation proved that agriculture and related activities are less important on destruction of geosites, contrary to earlier acceptances. Moreover, geotourists, who normally must be friends of geosites have been appeared as the most effective factor for destruction. Previous and present studies showed that very large or country-scale formations, for instance North Anatolian Fault or a high mountain are away from urgent destruction or any important threat (Kazancı *et al.*, 2004). In contrast, destruction even caused to increase earthscientific popularities of the large-scale geosites within tourists and visitors.

Fig. 3. Sensitive sites to destruction. A — Entrance of a lava tunnel, Kula-Manisa. B. — Fish of Late Miocene, Guvem-Ankara

Сл. 3. Објекти подложни разарању. А — Улаз у тунел од лаве, Кула Манса; Б — Риба горњемиоценске старости, Гувем–Анкара.

Threats on geosites which are currently active or close potential have been grouped into two large categories as *individual* and *combined* threats. *Combined* threats cover two or more individual threats. Both are important but primarily *individual* ones have been evaluated in this study.

A — *Individual Threats*: These are as follows in increasing order of effects. Photos show some geosite examples from Anatolia affected by the inroduced threat in the same paragraphs (Fig. 3–6).

1 — *Agriculture:* It includes all countryard activities i.e planting, farming, forestry. In spite of large spectrum in activity, the agriculture is the weakest threat on geosites. It is relatively more effective in central and southern Anatolia.

2 — *Trade / Business:* Local people, amateur collectioners and some gemologists are interested in trading of natural material, abundantly minerals, rocks and fossils. Foreigners, mostly from western countries are customers or buyers. It is pity that local people have a respect to traders saying "they are earning their life from stones".

3 — *Poor land-use:* This is important for particulary fossils sites. It results mainly from lack of awarness about geosites and just after a short explanation the related people stop their activities. However abundances of both geosites and population in the country increase its importance as threat.

Fig. 4. Destruction of travertines in Antalya. A — Example of housing or poor land use, B — Mining.

Сл. 4. Разарање травертина у Анталији. А — Пример изградње или лошег коришћења терена; Б — Рударство.

4 — *Mining:* This is especially big threat for recent formations and for sedimentary sequences, i.e. travertines. In recent years mining of all kind of rocks has showed a drastic increase in Turkey as they are using construction material in housing and consequently geosites are damaging liberately or deliberately.

5 — *Construction:* Road construction is predominant within this activity. Housing and large industrial investments are also important causes of construction. It is noteworthy that sometime constructions may cause to be visible of some geo-successions.

Fig. 5. Some threats are necessary; A — a touristic investment in Lake Van, B — Natural erosion, Nevsehir.

Сл. 5. Неки угрожавају је потребан. А — Туристичко улагање у језеро Ван; Б — Природна ерозија, Невсехир.

6 — *Erosion:* This is the most important threats especially for small and erodible sites. It is sometime indirect results of other activities, i.e construction, mining or poor land-use.

7 — *Raw material:* In additon to mining, raw material usage is the most important destructive activity on geosites, particulary on pyroclastic and sedimentary successions i.e. maars and colluviums. The loose characters of many sites seem to be very convenient for easy and cheap mining.

8 — *Geocollectioners:* Expert or plain geologists, geology students, geology-lowers and amateurs are the most effective threat on geosites in Turkey. They love to take samples from geosites not for trade but for private collections. Sometime foreign paleontologists make large collections from specific areas. Especially sites around the big cities have been destroyed completely by this way.

Fig. 6. Urgent measures are needed for some localities, A — Meke Maar, Konya, B — Reclam of a villager for selling of a foot print in Kula.

Сл. 6. Неким локацијама су потребне хитне мере. А — Меке Маар, Конја; Б — Реклама мештанина за продају отиска стопе у Кула.

9 — *Tourism:* Tourism investments and tourist activities, planned or unplanned, destroy geosites. This is the biggest / most important agent on geosite destruction; unfortunately tourism is supporting officially in Turkey. It is abundantly effective on coastal zones.

Distribution of individual threats

The main destructive agents on geosites including geoheritages were introduced above. Number of them is nine and their proportions have been shown in Fig. 8. Readers should remember that threat types and proportions were produced from only registred Turkish geosites. It also should be stressed that the real threat is the bad result of these activities not directly themselves

Fig. 7. Touristic sites, A- Dim Cave, Antalya, B- Stone houses constructed on tuff by digging in late Hitite time, Karaman.

Сл. 7. Туристичка места. А — Пећина Дим, Анталија; Б — Камене куће од туфа исклесане у доба Хитита, Караман.

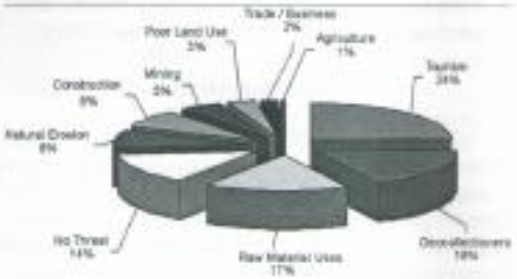

Fig. 8. Distribution of effects (threats) on geosite destruction to JEMIRKO's proposal forms

Сл. 8. Проценат оштећености објеката геонаслеђа према узрочницима, према анализи ЈЕМИРКО.

i.e tourism or construction (nobody should not present conservationists as enemy of tourism).

It is nice to find that 14% of Turkish geosites appear free or away from threat of destruction (Fig. 8). In essential it is not a satisfying result as it depends on large size of geosites i.e. North Anatolian Fault, Mount Erciyes.

B — *Combined threats*: The case is merit if two or more threats are together affective on geosites. By the investigation of proposal forms, four groups of combined threat have been defined. They are:

Combined 1 — *Tourism + Construction*, **Combined 2** — *Natural Erosion + Construction*, **Combined 3** — *Natural Erosion + Geocollection + Business*, **Combined 4** — *Agriculture + Construction*. The ratio of effect of each threat within a group is not equal, however it

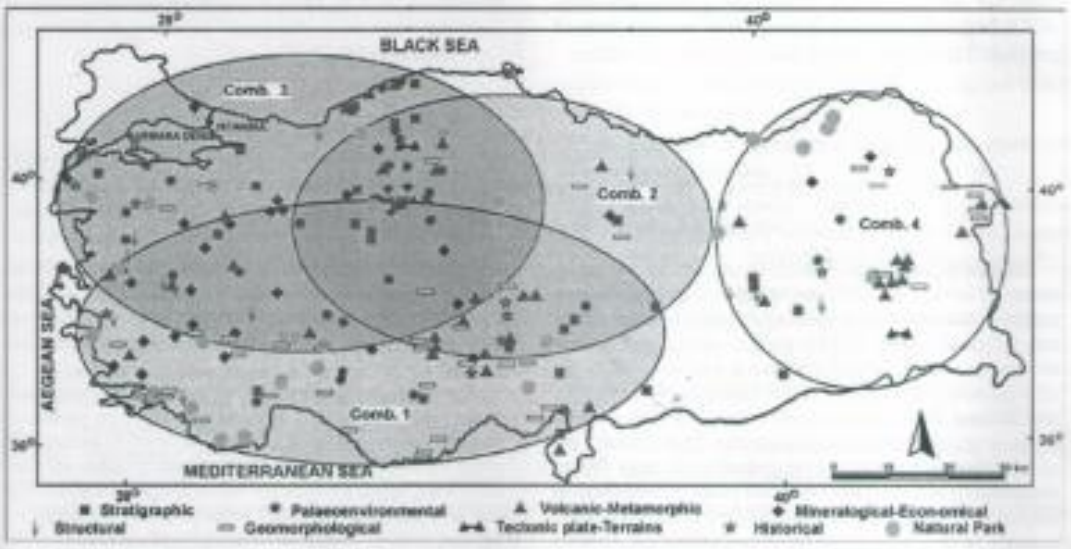

Fig. 9. Distribution of Combined threats in Turkey. Symbols indicates geosite groups.

Сл. 9. Локације вишеструко угрожених објеката у Турској. Симболи означавају групе објеката

is in important level. The Fig. 9 shows a general effect distribution of combined groups throughout Turkey.

Concluding remarks

Probably types of threat on geosites are roughly same in all countries even if their ratios are changeable. It is pity that the rate of destruction, the disappearing time span of a geosite which is under threat, from first description is very fast in Turkey, ca. 5, maximum 10 years. This is even shorter for fossil and mineral sites. From conservation point of view, the abundance of important cultural sites causes to ignore others including geosites. It should be remembered that, mostly based on its geography, Turkey has up to twenty thousands of cultural sites occured from Paleolithic to modern age beyond its geological richness. All these display that the situation for geosites, specifically for geoheritages is urgent in Turkey.

Turkey is a developing country, so circumstances are changing rapidly. It is not surprising that structural changes in the country would be parallel with *construction* and *tourism* activities. Hence they brings a large *threat* for geosites as both *individual* and *combined*. *Agriculture* and similar activities are relatively less effective on geosites as they are doing abundantly in Quaternary areas.

Tourism industry and *geocollectioners* are the most threatful groups for geosites. It is afraid that all small-scale geosites will be disappeared in next ten years, if the present case continues. Also geotrips, student excursions and geologists create a strong threat on geoheritage in Turkey, however it is largely deliberately. On the other hand, young generation and some NGOs began to get closely interested in protection of geosites. These are last and also big hopes for future.

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References / Литература

CO-DBP/GEO (Committee for the activities of the Council of Europe in the field of biological and landscape diversity), 2003, Draft Recommendation No. 1. on conservation of the geological heritage and areas of special geological interest in Europe. Working Group on the Geological Heritage, 2nd meeting, 15 September 2003, Room 2, Palais de l'Europe, Strasbourg.

Parkes, M.(ed). 2004, *Natural and Cultural Landscapes- the geological foundation*. Proceedings of a Conference 9–11 September 2002, Dublin Castle, Ireland, Royal Irish Academy, Dublin, 327 pp.

Kazanci, N., Saroglu, F., Kirman, E., Uysal, F., 2004, *Types and rates of destruction of geological heritage in Turkey*. Abstracts of 32nd IGC — Florence, 2004, Poster presentation in Symposia "T17.04 — Geology-maker of cultural and geological heritage: geosites under threat", Session no 123–11, p. 586.

Kazanci, N., Saroğlu, F., Dogan, A., Mulazimoglu, N., *in press*, Geoconservation and geoheritage in Turkey. In: *European Manual for Protection of Geological Heritage* (Eds T.Todorov and W. Wimbledon), Pro Geo's Publication.

Wimbledon, W.A.P., 1996, *Nationall site selection, a step on the road to a European Geosite List*. Geologica Balcanica 26; 15–27.

Резиме

ОСНОВНИ УЗРОЦИ УГРОЖЕНОСТИ ОБЈЕКАТА ГЕОНАСЛЕЂА У ТУРСКОЈ

Nizamettin Kazanci, Fuat Saroglu, Ediz Kirman, Fatih Uysal

Начини угрожавања објеката геонаслеђа су вероватно углавном исти у свим земљама, мада је степен угрожености различит. Жалосно је да је брзина распрострањења угрожених објеката у Турској велика, од прве регистроване појаве ово пет до највише десет година. Тај период је још краћи кад се ради о фосилима и минералима. Са становишта геозаштите, због великог броја значајних културних објеката запостављају се остали, па и објекти геонаслеђа. Треба имати у виду да углавном захваљујући географском положају Турска има скоро 20.000 културних објеката почев од палеолита до савременог доба не рачунајући геолошко богатство. Све то показује да ситуација у којој се налазе геолошки, односно објекти геонаслеђа у Турској захтева хитне мере.

Турска је земља у развоју, тако да се ситуација брзо мења. Није изненађујуће да структурне промене у земљи иду упоредо са изградњом и туризмом, а они увелико угрожавају објекте геонаслеђа и појединачно и удружено. Пољопривредне активности релативно мало утичу на геолошке објекте, јер се махом одвијају у квартарним областима.

Туристичка индустрија и колекционари геолошких предмета представљају најопасније групе по геолошко наслеђе. Постоји бојазан да сви објекти ситне размере нестану у следећих десет година уколико се овако настави. Исто тако, групни обилазак геолога, студентске екскурзије и геолози представљају велику претњу геонаслеђу у Турској и то је углавном намерно угрожавање. С друге стране, млађа генерација и неке НВО су постали више заинтересовани за заштиту геонаслеђа, што представља последњу и велику наду за будућност.