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ASSESSING AND MONITORING GEOECOLOGICAL STATUS OF WEST TURKISH LANDSCAPES FOR SUSTAINABLE DEVELOPMENT: PROCESSES, ACTIVITIES AND PROBLEMS

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Introduction: current environmental issues in Izmir region

A third large metropolis of Turkey, Izmir is an industrial city of high importance for the country. It is a key seaport harbor, strategic for the country and the Mediterranean region in general, highly important for the transportation network within the Aegean, Marmara and the Mediterranean Seas. Izmir is also known as an important country's business and fair trade center, where cross-cultural meetings, Expo exhibitions, international conferences, symposia and workshops being periodically organized. Therefore, the region has intensive anthropogenic activities: well developed transport network, intensive shipping and maritime construction, industrial factories and plants, urban densely populated districts, intensive agricultural cultivation. These factors taken together lead to strong anthropogenic pressure on the environment of Izmir. Overall, comparing to other Turkish regions (for example, central plateau regions, North Sea coasts, or eastern part of the country), western Turkey has more anthropogenic pressure on the environment due to the intensive industrial development on the region. Naturally, this includes various sources of contamination. Many research papers investigated currently the environmental conditions in Izmir surroundings, reporting various aspects of ecological sustainability in the region in the past decades up to now. The analysis of the most important relevant findings was performed, in order to illustrate current environmental problems within the Izmir region.

1. Terrestrial ecosystems. Nowadays, the most important problem in the Mediterranean basin, and in Aegean Sea area as its part, consists in land degradation. Thus, changes in climate conditions together with human impacts cause degradation of the semi-natural vegetation, which in turn, leads to the intensification of soil degradation, and finally causes erosion hazardous processes. As in other regions of the Mediterranean, these processes lead to changes in local landscapes in the Aegean eastern area (Izmir surroundings). The environmental changes in land cover types can largely affect vegetation coverage, especially in the coastal zones with sensible ecosystems.

The most important trigger factor for soil degradation is accelerated water erosion. Intensified by the destruction of the vegetation land cover and types, it increases desertification in the Mediterranean basin. Both soil and vegetation degradation are deeply interrelated, because the degree of soil degradation reflects the state of the vegetation that covers it: bare soils are being destroyed more quickly and intensively than the ones covered by forests or shrubs. Study of effects of changed land cover types on soil structure proved that extensive agricultural activities cause serious degradation and destruction of soils in highland Turkey. It demonstrates that the quality and structure of soils gradually deteriorate along with conversion of natural land types (e.g. forests, pastures) into cultivated agricultural lands. Namely, soil size particles, soil organic matter, hydraulic conductivity and other characteristics change. This demonstrates deep inter-related effects of various elements of ecosystems on the overall functioning and structure and illustrate negative effects of land use change on the natural ecosystems. Other negative changes in ecosystems include ongoing processes of changes in soil

chemical and physical properties, explained by the anthropogenic over-using of lands: cultivation, overgrazing, and over-harvesting [1]. As a result, this causes gradual soil deterioration and lands depletion.

The main issues of environmental current situation within the terrestrial ecosystems concern deforestation of precious forests communities, desertification and soils erosion and land degradation in the surroundings. Among others are plant cover and land degradation on Karaburun Peninsula, an important part of Aegean Sea ecosystems, well known in Turkey as one of the major undisturbed sites in western Turkey with precious biodiversity structure, aesthetic landscapes and unique environment. The land degradation is mainly caused by intensive construction of the summer cottages and touristic activities. Recent changes in land use types in selected regions of Turkey were detected using historical land use change analysis using measurements of carbon that indirectly indicate the extent of peatlands within the landscapes [2]. To other source of environmental threats belong radioactive wastes and radionuclides that originate both from natural sources, for instance leaching from minerals, and from pollutant sources, mostly from nuclear power plants, explosions and accidents. These factors of ecological contamination have direct impact on the terrestrial ecosystems.

2. Marine ecosystems: water contamination. The ecological threats to marine ecosystems include chemical contamination of the Izmir bay by detecting traces of mercury that originate from Gediz River and inactive mining sites (again, in Karaburun Peninsula) and come to shelf waters of the Aegean Sea [3]. The detected content of mercury in selected plankton organisms exceeds the one acceptable by WHO standards as a maximal limit in living creatures. This well illustrates the scale of the contamination of Izmir bay. The study results from the Institute of Marine Science and Technology, Dokuz Eylul University report oceanological characteristics of the Izmir bay and analysis of biological cleanness of the waters [4]. Assessed by various oceanological parameters, the waters are found to be polluted critically in the inner part, significantly in its central part, while only more or less satisfactorily in the outer part of the bay. This confirms that Izmir Bay is claimed to be one of the most polluted estuaries in the Mediterranean Sea. Since hydro- and oceanological characteristics are vital parts of the ecosystem, the polluted shelf waters illustrate environmental and ecological threats in the region.

3. Anthropogenic pressure. Apart from “usual” anthropogenic activities typical for the industrial city and its surroundings, the region is being intensively visited by tourists, both international and Turkish ones. The touristic attractiveness of the Izmir region is explained by its natural environmental settings, favorable climate conditions, scenic landscapes and cultural richness. The development of the tourism covers both traditional coastal areas and geothermal hot water springs. Both rich natural resources and human treasures of Izmir (traces of old civilizations, historical, archaeological and ethnographical cultural heritage), traditionally and deservedly attract large number of tourists in western Turkey all year round. This definitely has positive influence on the local economics and tourism development. However, the non-controlled anthropogenic pressure also has potential negative consequences. As a result of multiple factors, this region is recently being under pressure from both natural factors (changes in climatic conditions), and from the anthropogenic activities (industrial harbors, factories, overuse of pastures, etc). The local landscapes and land cover types are affected and disturbed in various ways by intensive industrialization, uncontrolled urbanization, high anthropogenic pressure and non-sustainable mass tourism. All these factors break natural balance of fragile ecosystems, lead to changes in land cover types and may cause irreversible processes in natural functioning of the ecosystems.

4. Conclusion. The described above multifold factors impact the environment, lead to the irreversible consequences, and cause destruction or loss of the elements within the ecosystems. Therefore, the efforts have been taken to protect the environment and landscapes in Turkey from possible deterioration, and to create effective ecological monitoring system [5]. The history of active and official nature conservation measures in Turkey goes back to 1961. Nowadays, there is a variety of

protected areas in Turkey which can be classified to the following types: National Parks, Natural Sites, Nature Protection Areas, Natural Monuments, Natural Parks, Wetland Areas, Private Nature Protection Areas and other areas. Among them, special protected areas in Turkey are located in coastal areas of Turkish seas: Mediterranean Sea, Aegean Sea, Marmara Sea and Black Sea. Coastal areas have special environmental value, since these include habitats of nesting and living places for strictly protected marine species: sea turtles (*Caretta caretta*) and Mediterranean Monk Seal (*Monachus monachus*). The protection status of these areas is conveyed to Special Environmental Protection Agency of Ministry of Environment. Creation of such areas aims to protect rare species from the extinction, and to maintain natural landscapes from negative environmental changes. The precautions that are taken by UNEP to protect nature in Turkey include creation of biosphere reserves zoning schemes, establishment of the responsible use of natural resources, harmonization of different types of activities, land use purposes and functions within special nature zones, complex landscapes zoning and coordination. It furthermore implies creation of potential ecological corridors, identification of endangered species as target objects for conservation and protection, evaluation of the value and significance of the landscapes, assessment of their carrying capacity and environmental resilience, typological analysis of habitats and vegetation types. The landscapes of Turkey form important part of the Mediterranean region. In general, along with ecosystems from other regions of the planet, they form natural heritage of the Earth.

Monitoring land cover changes is necessary for maintaining environmental sustainability. Up-to-date information, spatial analysis and regular actual reviews are necessary tools. As proven by various research that were reviewed and discussed in the current work, drastic land use changes have been recorded and detected in diverse regions of Turkey, including western coastal areas of Izmir surroundings. Thus, it is evident that nature protection and environmental monitoring of the Aegean landscapes are important environmental actions that should be supported by relevant agencies. Current paper provided a brief yet complex and detailed review of current ecological problems in western part of Turkey. It contributes to the geocological monitoring in this part of the Mediterranean region.

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