

Human-caused Soil-ecological Changes and Their Effect on The Biosphere

The soil cover of most land areas plays a crucial role in the conservation of The Biosphere and in maintaining the quality of water, air, food, and Nature's and human health. Thus soils support plants which produce highly valuable and widely essential-for-Mankind foodstuffs and raw materials. Soils accumulate and distribute solar energy, which is transformed by photosynthesis in plants, all the time helping to maintain a normal balance of oxygen, carbon, and nitrogen, in the atmosphere. Soils also act as a screen that retains the important biophilic elements in the phytosphere, thus inhibiting their loss in runoff to the world ocean. Moreover soil, with its component microbiota, is a valuable biological absorber and neutralizer of pollutants and contaminants. Thus for all Humankind and Nature the soil cover comprises an essential complex of natural resources and environmental services that are used in agricultural and other aspects of our economic and social life.

Soil is a fragile, easily destroyed component of Nature. In the world nowadays, from 5 to 20 million hectares of arable lands are lost annually to dereliction or other uses or misuses than cultivation, which is 2.5 times as high an annual rate of loss as the average suffered during the latest 300 years. Indeed according to some forecasts, the area of soil cover on cultivable lands of our planet will in time become further reduced to half or less of its former total.

During historical time, the Earth has lost some 2 thousand million hectares of cultivated land — a territory that is larger than the area of all modern arable land, which totals some 1.5 thousand million hectares. For each person now living, between 0.1 and 0.2 hectare has been lost through the construction of roads and runways, or the laying of pipes and provision of playing-fields, golf-courses, and car-parks, etc. Up to 5% of all land is now under cities, towns, or other human settlements, and each 20 years this area more or less doubles in extent. For Humankind is now pandominant, yet short-sightedly puts its own needs or mere desires or habits first, before consideration of its life-support The Biosphere.

The losses of so much soil are connected not only with industrial development and population growth, but are also due to improper land utilization and wastefulness in agriculture. The lack of knowledge, unwise exploitation or sheer waste of land, and annihilation of forests and grasslands, are all major reasons for widespread soil degradation rather than a consequence merely of human habitation of The Biosphere.

The degradation of soil also weakens the environmental situation for human beings. The deficiency of agricultural products and their low quality in some areas induce various diseases and may cause irreversible genetic changes in crops. Moreover the people from the areas of degrading soils move to cities, causing overpopulation and unemployment, and increasing the incidence of crime and other social problems.

The soil cover of our 'only one Earth' is extremely diverse but relatively unstable. There are up to 10,000 species and varieties of soil-inhabiting microbiota on the territory of the Soviet Union alone. Similarly diverse are the types of degradation of the soil cover — among them of soil pathology, nutrient depletion and partial sterilization, destructuring and over-compaction, accumulation of toxic compounds, salinization, invasion by pathogenic organisms, deterioration of aspects of the soil climate and texture, and partial or complete degradation of the soil profile caused by agriculturally-generated erosion as well as industrial and military activities. Widespread phenomena include the loss of organic matter, surface erosion following deforestation and other devegetation, soil wash-off and weathering, acidification, development of soil geochemical anomalies, and contamination of soil and water by both fertilizers and biocides. The above problems vary greatly according to the region: permafrost, mountain areas, deserts, deltas, steppe plains, tropical forests, savannas, etc.

The project of which the above title is provisional, was unanimously approved by the Advisory Board of Experts of the Vernadsky Centre in Pushchino at its first Annual General Meeting on 7 June 1991. Clearly it will require the integrated collaboration of numerous leading specialists world-wide to institute and pursue perennially.

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