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Defining Provisions on Soil Erosion as a Basis for the Establishment of a Database

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Abstract

Soil erosion is a constant process involving the movement of soil mass from one place to another, under the influence of water, wind and gravity. Among the numerous classifications that systematize erosion phenomena, the most important is the division of erosion into:

- natural erosion - caused by the forces of nature.

- accelerated erosion - caused by human activity.

Erosion processes caused by the forces of nature were most pronounced during the Ice Age, when the vegetation cover was insignificant. The appearance of higher plants: herbaceous and woody, greatly limited and even contributed to overcoming the action of erosion processes, accelerating soil-forming processes and the formation of soil cover.

Keywords: *Soil Erosion, natural erosion, accelerated erosion.*

Introduction

Soil erosion is a constant process involving the movement of soil mass from one place to another, under the influence of water, wind and gravity. Among the numerous classifications that systematize erosion phenomena, the most important is the division of erosion into:

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Erosion processes caused by the forces of nature were most pronounced during the Ice Age, when the vegetation cover was insignificant. The appearance of higher plants: herbaceous and woody, greatly limited and even contributed to overcoming the action of erosion processes, accelerating soil-forming processes and the formation of soil cover.

Human activity is the main factor that contributes to the development and increase in the intensity of erosion processes that degrade the surface of the continental part of the globe. Human activities have led to a significant, in terms of pace and size, degradation of the soil cover, a strong decrease, and even the destruction of its production potential, in comparison with natural conditions.

Depending on the factors causing erosion, the following classification has been developed:

- Wind erosion is the blowing of soil particles by the wind and their deposition in different places, depending on the strength and direction of the wind. Globally, about 550 billion hectares are subject to wind erosion;

-water erosion is the destruction of the soil cover and the demolition of its particles by water flows due to high-intensity rains and accelerated melting of snow in the winter-spring period;

-water-gravity erosion;

Agricultural (agronomic) erosion, which is divided into erosion resulting from tillage due to the plowing of the soil down the slope, as well as the so-called "pasture erosion" caused by overgrazing of a large number of animals per unit area. Globally, about 13% of soils are subject to this erosion.

The development and intensity of erosion are influenced by natural factors and human activities, i.e., land use. Their gradation determines the definition of an erosion threat. The most important factors are:

Climate - represented as precipitation, or the annual

amount of precipitation. From the point of view of climate, rain erosion caused by heavy rains, high-intensity rains, as well as thaw erosion caused by waters from sudden melting of snow are distinguished. An intermediate climatic factor is temperature. The erosion hazard coefficient increases with increasing rainfall.

The type and variety of soil - causing a tendency to erosion, depending on the mechanical composition of the soil. The most susceptible to erosion processes are loess, dust and sandy soils. The most resistant are clay soils, silts and skeletal soils.

Topographic features (relief) - mainly the slope of the terrain, which is determined by the speed of surface runoff, the catchment area and the rate of penetration of water into the soil.

Land use - land use has a very large impact on the emergence and increase in the intensity of erosion processes:

- the soil is most protected by the forest - dense forest cover retains a large amount of water on its surface, in the litter and undergrowth, protecting the soils from erosion;

- in second place is the herbaceous vegetation-turf, which also creates a dense ground cover and, in addition, binds the soil with roots, limits the surface flow of water, preventing or slowing down the movement of the soil;

-the most erosive hazard is agrotechnical tillage of soils

- Disturbed in the process of cultivation, the soil is easily washed out, especially when growing plants that require private loosening of the rows.

If we assume that the erosion hazard of forest surfaces is 1, then grasslands increase it by 5 times, and arable land - by 500 times.

The most adverse changes in soils occur as a result of surface washouts:

- deterioration of the mechanical composition, as a result of washing and removal of the smallest fractions (the smallest particles of the soil),

-reduction of porosity,

-reduction of water content,

- reduction of water permeability,

-deterioration of the water-air regime,

- decreased biological activity,

And ravine erosion leads to the complete destruction of the soil cover in places of erosion.

These changes are one of the reasons for the decline in soil fertility.

These processes lead to changes in soil classification. An important consequence of erosion processes in the environment is a change in the hydrological cycle.

Methods for determining the erosion threat in Poland

From a practical (economic) point of view, we highlight the following:

- potential erosion, described as erosion hazard, and

Actual erosion, described as erosion damage, expressed mainly by the size of the soil being moved (in mm thickness or t/ha or perkm2).

The first studies on soil erosion in Poland were conducted in the interwar period in the twentieth century. Field studies regarding the loss of the topsoil layer were carried out taking into account the types of soil and terrain [Vas, 1928; TOMASZEWSK; 1930] The research methodology was based on a comparative analysis of the measured terrain with a historical display presented on archival maps. The first work, characterizing the mechanism of soil erosion, became the basis for the subsequent development of good agricultural practices for soil conservation, the project implemented on this basis in several selected fields gave good results, however, due to economic and practical-organizational reasons, it was discontinued.

The oldest method of determining the potential threat from erosion is indicator-based assessment. An indicator of the degree of erosion hazard was created on the primary field of assessment, with a different surface, depending on the scale of the map. In this field, the numerical values of the threat were indicated by individual factors, and then a comprehensive complex indicator was created, which was, as a rule, the product of the values of individual factors. The first inventory carried out by this method on a scale of 1:15,000 for the territory of Poland was carried out by Anna Reniger.

In Poland, actual (actual) erosion losses are estimated at an average of 76 mg/kg (from 2.7 to 280 mg/km). The actual development and intensity of erosion, based on these measurements, in the territory of the Sudetenland was studied by Yanina Fatiga. Based on the measurements of the potholes, as well as the area and thickness of the sediment layer, the author concluded that the amount of soil carried away after one rain depended on the location of the fields, and ranged from 0.4 to 261 mg / km2 at the transverse location, and from 1.3 to 435 mg / km2 at the longitudinal location of the field. According to these data, a map of the actual distribution of erosion processes and their intensity for rural administrative units was created.

Much more often, potential erosion is investigated. On this occasion, there are many methods and models that allow you to parameterize this process and the factors that cause it. The latest methods of obtaining data reflecting the influence of natural environmental factors and models of

erosion hazard are computer applications in the GIS program.

Overview of models of potential threat from erosion in Poland

Models used to predict soil erosion allow you to select erosion control measures and evaluate their effectiveness. Thanks to this, through the appropriate organization of agricultural production, it is possible to reduce soil loss to an acceptable level and maintain soil productivity in the long term. There are qualitative and quantitative models.

High-quality model

The first model of this type was developed by a team led by Prof. Yuzefatyuks from the Institute of Soil Treatment and Fertilizer in Puławy. This model was based on the exemplary method of Prof. A. Reniger. on its basis, the processing of data on the registration of lands under the threat of erosion was carried out, and rules for its prevention were developed.

The purpose of the inventory was to determine, in the national territory, the degree of risk of surface water erosion, ravine erosion, erosion of mountain watercourses and wind erosion on agricultural and forest lands. For each of the types of erosion, the degrees of erosion threat were determined.

Degrees of soil destruction by water erosion

Grade 1 - Weak erosion occurs mainly in the form of a surface wash invisible to the eye. Its traces, in the form of small potholes and sediments, are easily leveled in the process of agrotechnical tillage.

Grade 2 - moderate erosion manifests itself in the form of potholes, changes the level of humus in the soil, reducing its amount, worsens the physical and chemical properties of soils. This process does not affect the formation of relief.

Degree 3- medium erosion intensively destroys the arable-humus layer, reaching even to the mother rock. Potholes and recesses are numerous, deep and cannot be corrected as a result of the processing process, causing the formation of wavy slopes.

Degree 4- severe erosion destroys the entire profile of the soil, pits and recesses are formed, entering deeper and deeper into the layer of the parent rock. As a result, a so-called erosion landscape appears with a characteristic dismemberment of the soil cover and the formation of ravines.

Grade 5 - Very weak erosion erods the entire soil profile, along with part of the foot, leading to severe fragmentation of the soil cover, the creation of a dense network of ravines, and the transformation of the agricultural area into waste land.

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