

DESERTIFICATION - A MASS PHENOMENON THAT CONTRIBUTES TO SOIL DEGRADATION

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Abstract: Desertification is a complex phenomenon, due to natural and anthropogenic causes, on vulnerable ecosystems in arid, semi-arid and dry sub-areas. The paper presents aspects of desertification, as a phenomenon of scale, at a global level, at the level of Romania, at the level of Oltenia and at the level of Gorj county. At the level of our country, the 11 counties in which global warming and drought will be ravaged in the following years are Timis, Mehedinti, Dolj, Olt, Teleorman, Giurgiu, Calarasi, Ialomita, Giurgiu, Galati and Vaslui, temperature increase and decrease the amount of rainfall being the main factors causing the desertification.

Key words: desertification, soils, deforestation, climatic changes

1. Introduction

Desertification is defined by the UN Convention to Combat Desertification as a complex phenomenon due to the combination of natural causes and anthropogenic pressure on vulnerable ecosystems in arid, semiarid and sub-dry areas as a result of the action of various factors, including climate change as well as human activities.

Soil degradation in dry areas is defined as a reduction or diminution of biological or economic productivity and affects one third of the terrestrial area and over 1 billion people. The total area affected by the desertification is 39.4 million sq km, which represents 26.3% of the dry area. The territories affected by desertification occupy 36% in Africa, 25.4% in Central and North America, the rest being distributed in Europe and Australia. Practically, desertification is a problem of sustainable development, that process of soil destruction and the expansion of the desert, also called Earth's cancer. The areas most at risk of desertification are: south-west Asia, the west of the United States of America, the center of Asia (fig. 1).

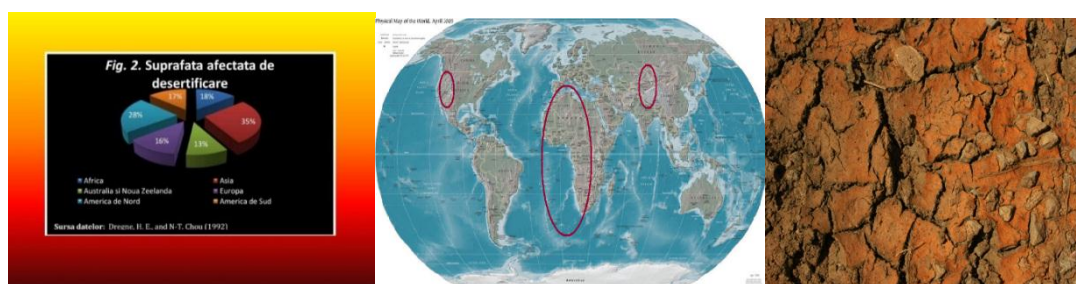


Fig. 1. Areas affected by the global desertification phenomenon

2. Global desertification

Issues related to the desertification process were brought into question by the UNCCD Convention on Combating Desertification, launched in Paris in 1994, which was signed by the Government of Romania and ratified by Parliament through Law no. 629/1997. Romania's interest in this issue is very high, given that 1/3 of the country's territory is a desertification risk area. In 1994, the United Nations General Assembly declared June 17, the World Day for Combating Desertification and Drought. The desertification was also a theme for the World Environment Day in 1984 after it was launched in 1972 in Stockholm.

The causes that contribute to the phenomenon of desertification are:

- deforestation
- excessive grazing
- erosion
- climate change
- over-empowerment and demographic growth

The phenomena that announce and highlight desertification are:

- reducing soil water reserves
- destruction of the vegetation cover covering the soil
- soil degradation due to increased erosion, salinisation, lateritisation, deflagration, crusting, aridisation, alkalisation
- reduce the amount of water that infiltrates into the soil, leaking it on the slopes generating an increase in surface erosion and sedimentation processes; the accelerated erosion of soils generates, in turn, more severe destruction of vegetation
- turning sand dunes fixed into mobile dunes and advancing them (sand dunes are relief shapes with the appearance of parallel coils that appear under the influence of wind in sandy regions or winds or hills formed by wind on the shore of a sea or in a sea, a desert)

3. Desertification at the level of Romania

Romania's desertification has been signaled since the beginning of the 19th century. XX, the major causes being climate and society-induced. In the last hundred years there has been a decrease in rainfall, global warming and drought intensification.

According to the Office of Pedological Studies, more than 1000 hectares are covered by sand every year, the process of erosion and desertification being most evident in the southern Romanian Plain, Dobrogea and the south of Moldova (Plateau of Moldavia).

According to the IPCC (Intergovernmental Panel on Climate Change) data, one third of Romania's territory, ie approximately 7 million hectares and 40% of the agricultural area, is in desertification risk areas (fig. 2).

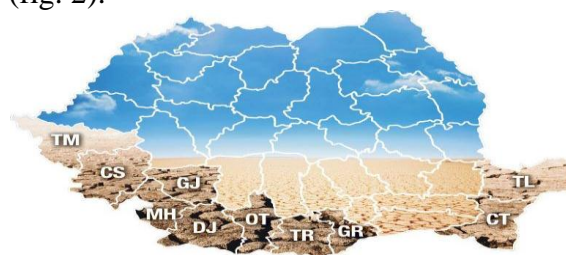


Fig. 2. Areas affected by the phenomenon of desertification in Romania

Romania's interest in this problem results from the fact that 1/3 of the country's territory and 40% of the agricultural area are located in areas with desertification risk, and in the counties Dolj and Olt there are already sands. At our country level, desertification is manifested through:

- reducing areas covered with vegetation
- severe intensification of soil erosion through water and wind
- intensification of salinisation
- crucifying and compacting the soil

- drastic soil degradation in organic matter and nutrients
- increasing the frequency, duration and intensity of droughts
- the progressive increase in the intensity of solar radiation

Excessive deforestation threatens Romania's ecological balance, food safety and population health. In 1900 Romania had 18 million hectares of forest, in 1945 it was 9 million ha, and in 2013 it was only 6 million ha of wooded land. The 11 counties where global warming and drought will be ravaged in the following years are Timis, Mehedinti, Dolj, Olt, Teleorman, Giurgiu, Calarasi, Ialomita, Giurgiu, Galati and Vaslui.

This danger is being discussed in Braila after the Great Island was taken out of the waters and relayed to the agricultural circuit.

The western part of the country, especially the countryside, is threatened by a real risk of desertification. The causes of this phenomenon in Timis county are:

- inappropriate irrigation practices
- extracting biomass in excess
- deforestation
- climate change accelerates the desertification process
- human activities are the main and most destructive cause

In Timis county, the wilderness area near the border with Serbia and Hungary, as well as the Mureş basin, poses a maximum risk of desertification, and the arid climate amplifies the lack of groundwater that this area faces. Because in the Western Plain, the 10 degree Celsius isotherm marks the contact between the plain and the western hills, with the multi-annual average of 10.7 degrees Celsius in Timisoara, only the western part is vulnerable to a severe drought and desertification.

4. Desertification at Oltenia

At Oltenia level, Dolj county is the most affected by this pollution phenomenon. Sandy soils stretch over an area of 140,000 ha and after rain the water can not stay in the soil in the conditions of the area for a maximum of 10-15 days, so the drought phenomenon immediately appears. The area is characterized by a sandy soil, an unproductive sand, which without irrigation does not even grow grass and the only culture that is suitable is watermelon green and yellow.

The presence of sandy soils that do not retain water, prints the southern part of the Dolj, the character of the semiarid area, with aridation accents (deepening of the groundwater level) and desertification (the vegetation carpet disappearance).

1/3 of the arable land in Dolj county is arid, over 1000 hectares each year are covered by sand and the phenomenon of desertification is growing in this area. Oltenia is slowly turning from the Gray of Romania into the small Sahara. It is estimated that over the next 50 years fertile fields in southern Romania could be completely covered by sand. Instead of fields cultivated with cereals and tomatoes, dunes have appeared in Dolj county, and due to the low rainfall and very high temperatures in recent years, the earth turns into sand.

Sahara Oltenia is an area of approximately 800 km², or 6% of Dolj county, stretching from Calafat to Dăbuleni, severely damaged by desertification, being almost a desert. The main cause of the desertification is the clearing of the forest curtains that stopped the desert. If in 1970 the forests covered 12% of the county's surface, it currently occupies only 7% -8%. 9,000 ha of forest have been grubbed up between Sadova and Corabia for irrigation systems. Over the last 30 years, the proportion of woodland has fallen by almost half. When it rains, forests are like a sponge, they absorb water and prevent the formation of torrents on the

slopes. Acacia forests planted prior to 1990 to fix the dunes were cut and the afforestation could take over 20 years.

Desertification is present in the communes of Sadova, Dăbuleni, Mârșani and Desa, where the soil conditions in Dolj County and the phenomenon of wind deflation, ie the sand dump by the wind, lead to the phenomenon of soil desertification, currently 4% -5% of the soil the county being a desert, but the phenomenon continues. In Sadova, the temperature has increased by 0.2 degrees Celsius in the last years and over 2,000 hectares are covered with sand, ie more than half of the total agricultural land of the commune. The solution could be reorienting to exotic crops, suited to new soil and climate: kiwi, peanut, batat, Chinese potato. The phenomenon is intense in the Dăbuleni area, where deforestation has had a catastrophic effect.

In Dolj county there are 140,000 ha of sandy soil or psamosols (with low fertility), of which 85,000 hectares are degraded lands because of the soil-climate relationship, land-scrubbing and land-modeling that favors desertification. And in the Bistreț - Ciuperceni - Piscu Vechi area and in the extensive areas of the Bulzești and Argetoaia communes the phenomenon of flying sands (fig. 3).



Fig. 3. The phenomenon of desertification in Dolj county

6. Desertification at the level of Gorj county

In the period 2000-2011, at the level of Romania, 280,108 ha of forest were destroyed or degraded. The rate of forest degradation remained at the same level in 2012-2014, with the total affected area being 361,068 ha and 34,870 cases of illegal cuts in the year 2015, which is 96 cases per day.

According to the Greenpeace Ecological Organization studies, Gorj county is in the first counties of the country for deforestation, registering 1353 cases of illegal tree cuts in 2015, which represents a risk in the phenomenon of desertification (fig. 4).

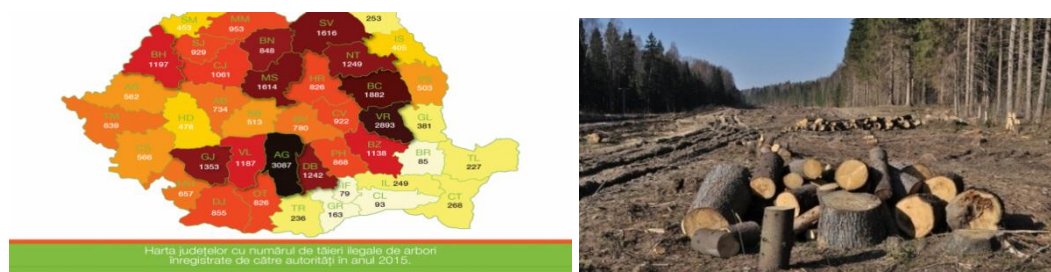


Fig. 4. The location of Gorj County in Romania as regards deforestation

Anthropic desertification was called into question in 2003, when the results of specialized statistics revealed that this type of desertification is maintained by the expansion of surface mines and surface quarries. Minerals are extracted from quarries, surface extraction

areas representing concentration and reflection areas that capture and amplify the heat of the sun's rays under the concave mirror effect. The greenhouse effect appears in situ, and these areas become the focus of desertification expansion.

In Gorj County, the basic industrial activity is the mining and energy activity, so the up-to-date exploitation of lignite in quarries and the production of electricity in the two Rovinari and Turceni thermal power plants. As a result of these activities, the enormous degraded soil surfaces have a disturbed relief, consisting of heterogeneous mixtures of rocks, gravel, sand, vegetation-free and strongly subject to erosion. The surface exploitation of the lignite in the Gorj County has affected more than 15,000 ha of land, resulting in huge areas of anthropogenic soils or industrial wastelands, which lack basic abilities: fertility. It is necessary to apply strategies and measures for rehabilitation or ecological rehabilitation by applying specific technologies. Due to the heterogeneity, the recultivation process is very complex, because the necessary measures can not be differentiated on each type of material, and different treatments are needed. Sustainability is the quality of an anthropic activity that takes place without exhausting available resources without destroying the environment and without compromising the possibilities of meeting the needs of the next generation (fig. 5).



Fig. 5. Industrial waste in Gorj county as a result of the upgrading of the lignite

In Gorj, desertification is manifested through:

- reducing areas covered with vegetation
- severe intensification of hydrological and wind erosion of the soil
- salinisation, crusting and compaction of soil
- decreasing the percentage of organic matter and soil nutrients
- increasing the frequency, duration and intensity of droughts
- progressive increase in the intensity of solar radiation and average temperature

Desertification is a problem with serious global implications for biodiversity, eco-safety, eradication of poverty, socio-economic stability and sustainable development. At the modal level (fig. 6):

- out of 5.2 billion ha of arable land, 3.6 billion ha have suffered soil degradation phenomena
- in 110 countries, one billion people are affected by desertification
- 2 billion people depend on dry land ecosystems, of which 90% live in developing countries
- in underdeveloped countries, overpopulation produces pressure for the agricultural exploitation of arid areas. These regions have a small production margin, they are overpopulated, the land is exhausted, and it is unable to support the local population, resulting in the reduction of livelihoods and their mass migration to urban areas.

The negative effects of desertification are as follows:

- ✓ 10% - 20% degradation of dry areas, ie a total desertification area of 6 - 12 million km
- ✓ the occurrence of the laterisis phenomenon (decrease in fertility, productivity and soil regeneration capacity, ie the formation of lateritic soils, very poor fertility)
- ✓ destruction of biomass
- ✓ forest degradation
- ✓ drought
- ✓ flood increase in riverside areas, water quality reduction, sedimentation in rivers and lakes, clogging of accumulation lakes and waterways
- ✓ decline in food production, poverty and famine
- ✓ decreased population health and risk of epidemics (allergies, eye infections and respiratory difficulties due to sand storms)
- ✓ occurrence of illegal acts and conflicts
- ✓ the appearance of dust storms



Fig. 6. The effects of desertification

Conclusion

- The total area affected by global desertification is 39.4 million square kilometers, which is 26.3% of the land area.
- The causes that contribute to the phenomenon of desertification are: deforestation, excessive grazing, erosion, climate change and over-empowerment and demographic growth.
- Desertification is a problem with serious global implications for biodiversity, eco-safety, eradication of poverty, socio-economic stability and sustainable development

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