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Atmosphere and pedosphere

Theme :

**The human role in raising the ratio of dust particles
in the air of the desert city of Zulfi**

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1- Article title

Decline in vegetation cover due to human growth and activity in Al Zulfi city





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Summary of the research :

The aim of the current research is to identify the effect of earthy plankton on the growth of plants in the desert city of Zulfi, and follow the descriptive analytical approach, where data, statistics and illustrations related to the phenomenon of dust and its relationship to the density of vegetation in the desert city of Zulfi during the year 2020 were described and analyzed. The occurrence of the phenomenon of dust is frequent in the summer and spring seasons, and that human activities have a prominent role in raising the proportion of dust plankton, as it has been observed that there has been a remarkable increase in the amount of dust during recent years due to several factors, the most important of which is logging, and this affects the amount of vegetation cover. The percentage of pastures in the desert of Al-Zulfi city is about (30%) degraded



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Introduction

Dust storms are one of the most important climatic manifestations in Al-Zulfi Governorate, as this phenomenon represents an environmental problem, the damage of which worsens day after day as a result of human intervention due to human activities such as overgrazing, logging, urbanization, etc. Crawling leads to many environmental problems that have negative effects on the biosphere, including vegetation.

Thus, we find that dust and dust-laden storms negatively affect the health of plants, as the dust works to block the stomata of plant leaves and prevent them from the photosynthesis process (Al-Wakeel, 2017).

We all know the important role of vegetation in the biological community and the resulting biochemical processes of absorbing carbon dioxide and producing oxygen. Vegetative cover is not only environmentally friendly, but it is the cornerstone of its construction. A good example of this is the negative effects that result after logging and the disappearance of plants, as this is reflected in the migration of animals, high air temperature, dust storms, weak soil construction and ease of disintegration (Ali, 2017).

Research problem

The city of Al-Zulfi is located in a desert environment characterized by a significant decrease in the rate of rain in the winter and a significant increase in the temperature in the summer, and thus the ecosystem is weak and easily changeable and prone to shattering, and despite the difficulty of measuring or controlling these changes, it can be controlled by treating the expected effects. Through previous research and studies that aim to understand the reality of the change in the general trend of how suspended dust affects vegetation, and then determine the negative role of humans in the desert environment, which in turn increased the proportion of suspended dust as a result of performing some activities such as logging, overgrazing and the abundance of land lines. Abandoned fields, and the introduction of new breeds of livestock.

Research questions

In light of the research problem, the researcher seeks to answer the following main question:

"How do dust storms degrade vegetation in the desert city of Zulfi?"

The main question is divided into the following sub-questions:

- (1) What are the annual seasons in which the dust phenomenon occurs more frequently than others in the air of the desert city of Zulfi?
- (2) What is the role of human activities such as logging, overgrazing, supplying land lines, abandoned farms, bringing in livestock whose feeding is not compatible with the amount of vegetation cover, and urban expansion in raising the percentage of soil plankton?
- (3) What are the methods used to reduce the percentage of dirt plankton in the air of the desert city of Zulfi that resulted from human activities?

research aims

The main objective of the current research seeks to identify the effect of soil plankton on plant growth in the desert city of Zulfi by achieving the following objectives:

- (1) Highlight the annual seasons in which the phenomenon of dust occurs more frequently than others in the air of the desert city of Zulfi.
- (2) Clarifying the role of human activities such as logging, overgrazing, supplying land lines, abandoned fields and farms, bringing in livestock whose feeding is not compatible with the amount of vegetation cover, and urban expansion in raising the proportion of soil plankton in the air of the desert city of Zulfi.
- (3) Determining the methods used to reduce the percentage of dusty plankton in the air of the desert city of Zulfi, which resulted from human activity.



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Research importance

The importance of the current research stems from the identification of human activities that affect raising the proportion of dust plankton, which in turn reduces the amount of vegetation cover in the city of Zulfi, and from here the importance of the research crystallized in the following points:

- (1) The research area “Al Zulfi City” is considered one of the cities in which the proportion of dust suspended in the air increases, as a result of the presence of dust storms that remain for about three months of every year, as they affect the amount of vegetation cover in which the negative effects are highlighted through Crushers for rock making and crushing.
- (2) It opens the way for human development service and proper planning to preserve human health by raising human awareness and taking appropriate preventive measures to reduce the impact of the phenomenon of dust plankton, in addition to the recommendations reached that contribute to supporting environmental and agricultural development in the research area.

- (3) It enriches Saudi libraries to reach a comprehensive theoretical background on the human role, such as logging, overgrazing, supply of land lines, abandoned fields and farms, bringing in livestock whose feeding does not match the amount of vegetation cover, and urban expansion and its impact on raising the proportion of soil plankton in the desert city of Zulfi air.
- (4) It contributes to determining the relationship between the role of human activities and the phenomenon of dust plankton in the air of the city of Zulfi and its impact on the amount of vegetation cover, in light of the scarcity of studies, especially in the area of this research.

The data entry page from the Globe website

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جو

الهواء الجوي: *	الهواء درجة الحرارة 1 يوم *
مراقبة جديدة	مراقبة جديدة
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* Multi-Day Soil And Air Temperatures	* Multi-Day Soil And Soil Temperatures
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The theoretical background of the research

First : the theoretical framework

It is no secret to everyone that human activity is one of the causes of suspended dust. An example of this is that some companies that discover rocky sites for use in construction purposes create pits that dump their waste outside them in the form of piles of dust and thus provide materials for dust storms, this is in addition to what the crushers do From breaking up rocks of large sizes, separating the rough from the fine and leaving the latter to be manipulated by the wind, and the cars that transport sand and rocks when they move from the sites of crushers in the desert to the urban areas, they work to break down the vegetation that is exposed on their way and work to soften the sediments of the cohesive soil that drives Thus, it would have made the path easier for winds to affect these sediments and carry them to form dust storms. The animal also has a role in this field, where herds of sheep feed on the natural plants in the desert that work to stabilize the soil and thus this cover is destroyed by the presence of these herds, exposing soil deposits to the wind to form a material of dust storms.



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First : the earth plankton

They are clusters of dust particles (1-50 microns in diameter) or sand (50-500 microns in diameter) raised by the winds from the surface of the earth to different heights (more than 100 meters in the case of dust and less than that in the case of crawling sand). These phenomena often occur over areas covered with loose, dry sediments.

Where these particles or particles are transported by the rapid winds to areas far from the areas they generate, causing the erosion of the surface soil, adversely affecting agricultural lands and plant production, as well as leading to urban air pollution, visual pollution and low visibility. Which hinders the practice of any outdoor activity during storms, and leads to an increase in cases of respiratory diseases, allergies, asthma, etc., and also causes disruption of traffic, air and maritime navigation, which leads to many economic losses (General Authority of Meteorology and Environmental Protection, 2018 AD, p.68)

It is possible to calculate the frequency of sand and dust storms according to the months of the year and find the total frequency for each year, and the following table (1) shows that

Second: the rock crushing industry

The accelerating rate of urban development and population growth in the Kingdom of Saudi Arabia has contributed to the acceleration of the requirements for the integration of infrastructure and construction in various public and private services, and the increase in the expansion of residential and urban areas, land uses, the establishment of economic cities and various developmental projects has led to a significant increase in the demand for the exploitation of the necessary natural resources. Accordingly, the facilities specialized in extracting and manufacturing raw materials and basic materials needed for construction, construction and paving work have increased in various cities and governorates of the Kingdom of Saudi Arabia.

The competition between rock crushing enterprises and the production of asphalt and ready-mixed concrete to provide these materials to consumers was the main reason for creating them randomly in some governorates and villages. This was accompanied by many negative environmental impacts that were contained in the mining investment system issued in 2004, which requires intensifying operations Field inspection and follow-up of quarrying sites, monitoring and measuring various pollutants in petrification areas, especially air pollutants, and encouraging the use of environmentally friendly technology during extraction, manufacturing and production processes. It should also be noted that the Ministry of Energy.

● Lumbering :

Local residents or others carry out the process of logging permanently, in order to heat or cook, or to remove tree cover in order to establish agriculture instead, which causes the elimination of vegetation cover, especially perennial trees, and causes the disruption of the soil ecosystem, making it easier to erode and expand the area Desertification (Al-Hader and Salem, 2018, p. 398).

In spite of the availability of electric and petroleum energies, there are still a number of the Kingdom's residents who use firewood for heating and some other purposes, which led to the removal of already scarce trees. The efforts of the Ministry of Agriculture helped a lot in reducing the phenomenon of logging by applying the regulations and instructions for preventing logging except with a license that allows Only benefit from dead trees and dry parts, based on the forest and pasture system issued by Royal Decree No. M / 22 dated 5/3/1398 AH, and in cooperation with the Ministry of Interior and its various agencies, but the infringement continues (Al-Allula, 2017, p. 27).

● Overgrazing :

Overgrazing is a common feature in the Kingdom of Saudi Arabia, and is due to the lack of pasture lands due to the expansion of the presence of crushers for the manufacture of rocks and building materials. This led to a decrease in pastoral productivity and the deterioration of the desirable species or their extinction and their replacement with low nutritional, toxic or thorny species, and in many areas the vegetation cover was completely removed and pastures turned into lands covered with sand and dust, see Figure (4).

Overgrazing is an important factor in vegetation degradation; This is due to the presence of a number of animals that exceed the capacity of the pastures, which affects the environment, whether permanently or temporarily, and overgrazing that exceeds the grazing load leads to the deterioration of vegetation cover, the decline of weeds, and the emergence of endemic plants other than the original plants (Al-Hader and Salem, 2018 AD, pp. 395-396)



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● Landlines (light and heavy ground vehicle paths)

Landlines are the ratio of the area of leaf shadow on the surface of the soil if perpendicular light is shone on the soil surface from above the plant, and it equals the shaded coverage minus the gaps that are not covered by the leaf. It is a good indicator of environmental sovereignty and knowledge of the composition of the plant community.

It is considered mainly in classifying vegetation cover into societies and in evaluating vegetation cover, and it is considered a good indicator in studies of soil protection from erosion, and it is a balance between the contribution of small with high abundance and that of large rare plants, in which it does not need to identify plant individuals.

The need to increase the area of vegetation appeared long ago in order to stop sand encroachment and to protect farms by lowering the temperature as well as limiting wind speed to reduce evaporation and transpiration and to combat soil erosion the impact of rain, which is often in strong showers that occur in torrents and erosion of the soil surface. The need to improve the residential environment by afforesting the streets in cities and villages and creating places for recreation and leisure, and the human being deliberately removed the vegetation cover for possession of agricultural lands, especially after the development boom that swept the kingdom, which raised the value of land and facilitated investment transactions, and increased pressure on land and extended it to land lines



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● Abandoned fields and farms

The fields, abandoned farms and neglected lands in Al Zulfi city as a result of low soil fertility or because of the high costs of extracting groundwater or greatly weak production, thus naturally leads to a decrease in the vegetation cover.

As a result, the Saudi Geological Survey established a program of "desertification studies" to examine its causes, work to enumerate and assess all the abandoned lands and farms that suffer from it, and to monitor the extent of its extension on it.

Also, afforestation in desertified areas such as fields and abandoned farms contributes to stabilizing moving sand dunes by choosing types of trees and shrubs that are resistant to drought and high temperatures and helping them to grow by increasing the amounts of rain water that reach them using different water harvesting methods and preserving soil moisture, either with a mechanical jacket such as agricultural waste or organic fertilizers or By chemical emulsion or germination of some weeds and pioneer plants. Shrubs most of the time need watering in the first years of germination. They must be helped by reducing the temperature and the speed of the drying winds by erecting mechanical fences or even small obstacles such as stones near the seedlings (Ministry of Agriculture, 1426 AH)



- **Bring in types of livestock whose nutrition is not compatible with the amount of vegetation**

Livestock, such as camels and sheep, is one of the important components that have received a lot of attention and encouragement by state institutions to encourage breeding, and investment in the field of livestock and camel raising in general through facilities in the lands in order to face the increasing and continuous numbers of demand that resulted from the population increase. This greatly increased the percentage of meat consumed, and led to a large gap that led to the need to import from abroad.

It should be noted that bringing in livestock that is not suitable for vegetation will directly affect the percentage of soil plankton, including dust. Because livestock imported from abroad eat a lot of weeds, shrubs and trees, which may lead to desertification as well as a lack of vegetation cover in the city of Zulfi, and from here the Kingdom began to import livestock that dealt with fodder and plants in a simple way in order to address this matter.

In light of the foregoing, one of the determining factors for the type of animal suitable for the use of plants of the type of vegetation in a pasture is mainly due to the nature of the preference of different animal species.



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● Urbanization

The human-induced urban expansion needs to reduce the vegetation cover in the city of Al-Zulfi, and this may increase the proportion of dusty plankton.

Due to the increase in urbanization and the lack of residential plans that are characterized by the presence of parks and gardens, which meet the needs of the population of entertainment, which leads them to build tents and design vehicles for camping in pastoral areas to benefit from them for hiking and raising livestock, which requires removal of vegetation cover in order to establish these communities, Thus, the pressure on vegetation increases, and then causes the loosening and erosion of the soil, as a result of random entry and exit of cars (Al-Hader and Al-Salam, 2018 AD, p. 398).

With the beginning of the Five-Year Plans, which accompanied the period of the economic boom (1970-1980 AD), rapid growth appeared in Saudi cities and the rates of migration from villages and small cities to major urban centers increased. The Zulfi region has witnessed population.

Establishments, In addition to the requirements of those plans of paved roads and government facilities, as there are many factors that have contributed to the increase of urban sprawl on agricultural and natural areas in the city of Zulfi, perhaps the most prominent of which is the high population growth rates and the need for lands for industrial establishments.

Second: Previous studies

The researcher found some previous studies that focused on human activities and their effects on vegetation through dust and sand storms such as dust, where the researcher listed some of them as follows:

A Xinhua study (2020 AD) aimed to reveal that human activities were the main factor affecting Asian sandstorms two thousand years ago, according to a new research article published in Nature Communications. The enhanced Asian monsoons facilitated the development of Chinese civilizations, thus Destabilizing the topsoil and thus increasing the frequency of sandstorms. This indicates that human activities that began at least two thousand years ago have begun to replace natural climate change as a major factor affecting sandstorms in eastern China, and it is expected that the results of the research will provide scientific support for the development of policies for organizing human activities and afforestation in arid and semi-arid regions. In northern China.

The study of Hoda Al-Lami and two older forecasters (2012 AD) dealt with the phenomenon of dust that occurs in Iraq from phenomena that cannot be controlled completely or partially treated in a short time, because they arise locally in large areas or from outside Iraq (from the Sinai desert, the Arabian Peninsula, and the Sahara ...) However, its impact can be reduced or its spread partially limited through factors that require great effort or time in addition to the economic aspects of that, and the results indicate that Iraq in general is affected by stuck dust, followed by the number of occurrences per year, rising dust and the third degree. Dust storms, and that 50% of the dust cases in the Baghdad region are associated with the southeast winds and 20% from the rest of the directions, and on the other hand, 75% of the cases are associated with winds exceeding 5 m / s. The phenomenon of dust from one year to the next due to the variation in climatic conditions, and there is an inverse relationship between rain and dust phenomena (suspended dust, rising dust, dust storms), as the less rain during the year, the higher the temperature, and in turn the dust phenomenon increases.

Commenting on previous studies

It is possible to benefit from previous studies by preparing the theoretical background for the research, choosing the research methodology, and determining the appropriate statistical methods, To answer his questions, to know how to interpret and discuss his results, and to formulate his recommendations and suggestions.

Research Methodology

The researcher follows the descriptive analytical approach, as he described and analyzed data, statistics and illustrations related to the phenomenon of dust and its relationship to the amount of vegetation cover in the desert city of Zulfi as a result of the impact of human activities (logging, overgrazing, supplying landlines, fields and abandoned farms, bringing in livestock whose feeding is not suitable for The amount of vegetation cover, urban expansion). As well as some available statistical data on highlighting the annual seasons in which the occurrence of the phenomenon of dust is more frequent than others, and it should be noted that the data sources and statistics were applied by the researcher in the field during the year 2020 AD.

Search area location

The search area is determined in the desert of the city of Al-Zulfi, as it is najid by the nature of its topography and represents an extension of the desert, and is devoid of some complex mountain formations, and next to the province of Zulfi there is the Nafud desert, or as the revolutionaries are called, and from the west the Qassim region, from the south the Al-Ghat governorate, and from the East Artawiyah, The area of Al-Zulfi Governorate is about 5400 km², and the population of Al-Zulfi Governorate reaches more than 72,000 people. The current research focuses on the desert of influence or the influence of revolutionaries in Al-Zulfi Governorate.

It is worth noting that the city of Al-Zulfi, its land is a low and extending plain between Jabal Tuwaiq and Al-Nafud, as it extended to include the lands east of Mount Tuwaiq, and its fertile agricultural land is with sedimentary soil interspersed with many valleys sloping from the Mount Tuwaiq chain and its waters are abundant, especially on the sides and at their estuaries, Among the most important natural landmarks are (Shuaib Samnan, Shuaib Markh, Wadi Al-Nom, Shuaib Urira) and other valleys and reefs. Among the most prominent natural features in the governorate are Al-Muttal Al-Sharqi Park, Al-Muttal Al-Gharbi Park, Rawdat Al-Sabla and Al-Kassar Winter Lake).

Research background applied

The results of the first question, which states: "What are the annual seasons in which the occurrence of dust phenomenon is more frequent than others in the air of the desert city of Zulfi?"

The researcher answered the first question by calculating the frequency of the phenomenon of dust in the desert of the city of Zulfa during the months of the year 2020 AD.

Figure (12) show that the year 2020 AD had the phenomenon of dust storms with a number of 115 recurrences, as the most frequent of them were in the summer seasons.



The researcher explains the existence of the dust phenomenon in the city of Al-Zulfi specifically, due to:

- The large difference in temperatures indicates a sharp difference in the atmospheric pressure values over a small area, which means an increase in the speed of the winds dramatically, as they move from high pressure to low pressure areas very quickly, causing huge amounts of dust.
- In the summer season, drought increases, soil moisture decreases, vegetation cover decreases, and soil disintegrates easily, as happened in the 2014/2015 season during which a dark storm was formed, and this matter differed during the 2015/2016 rainy season in which the dust waves decreased due to the abundance of rain and the increase in vegetation cover.

The results of the second question, which states: What is the role of human activities such as logging, overgrazing, supplying land lines (roads), abandoned fields and farms, bringing in livestock whose nutrition does not match the amount of vegetation cover



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And urban expansion in raising the proportion of dirt plankton in the air of the desert city of Zulfi?

The researcher answered the second question by calculating the average number of days of dust in the desert of the city of Zulfa during the summer months of 2020 AD due to various human activities such as logging, overgrazing, supply of land lines, fields and abandoned farms And bringing in livestock whose nutrition is not compatible with the amount of vegetation cover and urban expansion.

The researcher answered the second question by calculating the average number of days of dust in the desert of the city of Zulfa during the summer months of 2020 AD due to various human activities such as logging, overgrazing, supply of land lines, fields and abandoned farms And bringing in livestock whose nutrition is not compatible with the amount of vegetation cover and urban expansion

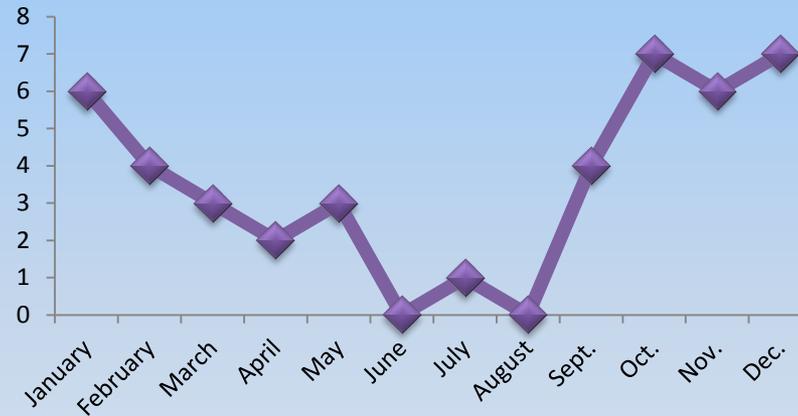


Figure (15) show that the frequency of soil moisture increases in the winter due to frequent rain, and decreases in the summer due to the decrease in the amount of air humidity and consequently the dryness of the soil, which contributes to its weak cohesion and then its disintegration. It is worth noting that the fertility of the soil of the city of Al-Zulfi and the abundance of its groundwater has a great role in making the region one of the regions famous for producing a number of agricultural crops, the most important of which is dates, as it is a sedimentary area that helps its soil to cultivate it, as for the cultivation of fodder it is very poor, and therefore this is reflected in the introduction of Livestock from outside, and overgrazing affects the amount of weeds, shrubs and trees that sprout in the winter in large quantities in the lands of this city. As for the rest of the seasons.



The results of the third question, which states: What are the methods used to reduce the percentage of dusty plankton in the air of the desert city of Zulfi that resulted from human activity?

A number of methods can be used to mitigate the effects associated with dust plankton in the air of the desert city of Zulfi that affect vegetation as a result of various human activities using a number of local measures and environmental control strategies, Whereas, it is illogical to avoid them and prevent their occurrence because they are natural phenomena, but necessary measures can be taken to reduce their effects as follows: (Swain, 2020).

- (1) Using mechanical methods in quarry stacks, such as installing specific filters to reduce dust emission.
- (2) Reducing the paths of cars and heavy equipment in the desert and surrounding them with belts of plants as possible.
- (3) Establish controls and laws for the mechanism for disposing of solid and liquid wastes from industrial establishments.
- (3) The use of natural barriers such as plants, which are characterized by being evergreen and with low water consumption in industrial areas and main roads.
- (4) Expanding the establishment of parks and green spaces in the city



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Summary of search results

In light of the above, the researcher summarizes the results of the current research in the following points:

A person works to reduce the vegetation cover in the desert city of Zulfi through his various activities, the most prominent of which is the logging process, which greatly helps to expose the soil as there is a marked increase in the amount of dust in the summer season, which in turn affects the vegetation. Most of the pastures in the desert of Zulfi city are degraded and suffer from a great shortage of shrubs and trees, and overgrazing and vehicle paths (land lines) are among the main factors that have led to the deterioration of vegetation cover, and therefore we find that there is a marked increase in the amount of dust in the summer, as well. Abandoned fields and farms are places that contribute to raising the dust percentage due to the disintegration and drought of their soils, and the import of types of livestock whose feeding nature does not match the scarcity of vegetation cover is one of the factors that lead to desertification, and finally we note that urban expansion has had negative effects on vegetation cover, due to High population growth rates at the expense of agricultural land.

(2) That the annual seasons in which the phenomenon of dust occurs more frequently than others in the air of the desert city of Zulfi is the summer season as a result of lack of rain, low soil moisture, lack of vegetation, and thus ease of soil disintegration

Recommendations

In light of the previous research results, the researcher recommends the following:

- (1) Activating the Ministry of Environment and Agriculture's decision on preventing logging and overgrazing to prevent the elimination of vegetation cover and soil erosion.
- (2) Work to bring in livestock that are compatible with the amount of vegetation cover in the Kingdom of Saudi Arabia.
- (3) In the event of importing types of livestock whose feeding nature is not compatible with the amount of pasture in desert areas, in this case the breeder shall ensure the use of feed imported from abroad that covers the needs of these animals.
- (4) Enactment of laws and legislations by the Ministry of Environment and Agriculture in the Kingdom of Saudi Arabia that work to prevent camping and the establishment of parks at the expense of lands covered with plants, to preserve them from extinction.
- (5) The necessity to establish and define industrial zones for the establishment of crushers for the manufacture of rocks in them and to reduce the aggression on vegetation cover, grazing and areas designated for housing.

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