Regional aspects of state land monitoring

A A Bayanova

A A Yezhevsky Irkutsk State Agrarian University, Molodezhnyj village, Irkutsk region 664038, Russia

E-mail: Bainova.aa@mail.ru

Abstract. The monitoring of the land use in the Irkutsk and Olkhon districts of the Irkutsk region revealed the presence of negative processes. At the investigated territory, water and wind erosion develop, occupying the largest area of negative changes, landslide-talus processes, which are formed in significant quantities on steep slopes, water logging, flooding, abrasion, which is characteristic mainly of the shoreline of Lake Baikal. Disturbed lands are formed as a result of mining, geological exploration and survey work, construction, and forest management. Warehousing and burial of industrial and household waste leads to littering and pollution of the territory. Detected negative changes lead to a significant deterioration of land. The obtained updated data will allow taking measures to prevent and eliminate the development of negative processes by improving and restoring land.

The legislation of the Russian Federation, the Land Code (Article 67), provides for government monitoring of land. The implementation of complex studies allows timely identification, evaluation, prediction, prevention, and elimination of negative changes [1, 2, 3]. The land monitoring is considered to be one of the main land management methods that allows, on the basis of systematic observations, to make optimal decisions on the most efficient and rational use of territories [4, 5].

The use and state of land is monitored in the process of government monitoring of land.

The obtained scientific evidence on the quality of land makes it possible to prevent and eliminate the development of negative processes, and therefore the chosen research topic is relevant. The aim of the research is to study the regional aspects of state land monitoring. The task of the research is to identify negative processes in the territories of the Irkutsk and Olkhonsky districts of the Irkutsk region. Research Method is remote sensing.

So, in 2019, in the Irkutsk region in the territories of the Irkutsk and Olkhonsky districts, the state and use of land were monitored under a government contract for the Rosreestr, limited liability company ScanEx Engineering Technology Center. Based on the results of the monitoring work, negative processes of both natural and anthropogenic origin were found in the investigated lands of the Irkutsk and Olkhon districts.

Irkutsk district is located in the southeastern part of the Irkutsk region on an area of 1134.778 thousand hectares, it borders on the regional center. In the south, it goes to Lake Baikal.

On the lands of the Irkutsk region, negative changes of natural and anthropogenic origin were detected on an area of 831.6573 thousand ha, accounting for 73.29%.

Studies have shown that in most cases, disturbed lands are formed as a result of water erosion processes, which is 76.27% of the total area of negative changes (table 1). Such sites located on sloping and slightly sloping slopes account for about 60% of the total area of the Irkutsk region, or 634.2915...
thousand ha. At the same time, 49.84% of the total area of development of this type of disturbed lands is affected by weak and moderate water erosion, an average of 43.74% and a strong degree more than 6.41%.

Table 1. Negative processes on the lands of the Irkutsk district.

| № | Negative processes                  | % of negative process from the total area of negative processes | The area occupied by the negative process, thousand hectares | % of the negative process from the total area of the district | Development degree of the negative process, % |
|---|-----------------------------------|---------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------|
| 1 | Water erosion                     | 76.27                                                         | 634.2915                                                   | 55.9                                                        | 49.84 43.74 6.41                                |
| 2 | landslide-talus processes         | 7.71                                                          | 64.1609                                                   | 5.65                                                        | 81.08 5.41 13.51                               |
| 3 | Waterlogging                      | 4.75                                                          | 39.4992                                                   | 3.48                                                        | 52.48 38.65 8.88                               |
| 4 | Flooding                          | 3.57                                                          | 29.719                                                    | 2.62                                                        | 35.27 61.35 3.37                               |
| 5 | Eutrophication                    | 1.13                                                          | 9.4304                                                    | 0.83                                                        | 71.56 28.44 -                                   |
| 6 | Saturation                        | 0.03                                                          | 0.2451                                                    | 0.02                                                        | - - 100                                       |
| 7 | Abrasion                          | 0.51                                                          | 4.2341                                                    | 0.37                                                        | 8.83 25.71 65.47                               |
| 8 | Production activities             | 6.02                                                          | 50.077                                                    | 4.41                                                        | - - -                                         |
| 9 | Subsoil management                | 0.12                                                          | 0.9858                                                    | 0.09                                                        | - - -                                         |
| 10| Industrial forest management      | 4.53                                                          | 37.6787                                                   | 3.32                                                        | - - -                                         |
| 11| Storage and disposal of industrial waste and land pollution | 0.03                                                          | 0.2359                                                    | 0.02                                                        | - - -                                         |
| 12| Burnt places                      | 1.34                                                          | 11.1074                                                   | 0.98                                                        | - - -                                         |

The development of landslide-talus processes occupies vast areas of the region, mainly on steep slopes. The identified processes occupy 64.1609 thousand ha, or 5.65% of the area of the Irkutsk region. In most cases, in the studied territory, landslide-talus processes develop to a weak degree and make up 81.08% of the total area of development of this negative change, 13.51% account for a strong degree.

The territory of the study area is subject to waterlogging processes. This change is ubiquitous in the lower parts, which amounts to 39.49992 thousand ha. Waterlogging of a weak degree occurs in more than half of the total area of development of this negative change and amounts to 52.48%, the course of the middle degree is 38.65%, and the strong one is 8.88%.

Flooding of low floodplains occupies 2.62% of the area, or 29.719 thousand ha. For the most part, the study area is subject to moderate flooding on 61.35% of the area, 35.27% is flooded to a small extent and 3.37% is severe. A strong degree of flooding is characteristic of areas of low floodplain of large rivers. The process of medium flooding affects rivers of medium length and width. Low-level flooding is observed in areas least affected by floods and floods.

Small areas are subject to eutrophication processes, which is 0.83% of the area, or 9.4304 thousand ha. Waterlogging weakly proceeds at 71.56% of the total area of development of the change. Eutrophication processes were identified on 9.4304 thousand ha, which is 0.83% of the area of the Irkutsk district and 1.13% is an insignificant area for this type of negative process. Mild eutrophication develops at 71.56% of the total area of development of this negative process, an average degree of 28.44%, a strong degree was not detected.

The least detected are the processes of saturation, which account for 0.03% of the total area of development of negative changes, 0.02% of the total area of the district, or 0.2451 thousand ha. In this case, a high degree of saturation is characteristic in 100% of cases, the average and strong degree of the process has not been identified.
The territory of the study area is characterized by a fragmented development of abrasion processes related to the shoreline of Lake Baikal. In this case, mainly abrasive processes are manifested to a large extent and amount to 65.47%, we have an average degree of 25.71% and a weak degree of 8.83%.

The anthropogenic origin of negative changes as a result of production activity has a moderate distribution of 6% of the total area of development of negative processes 4.41% of the area, which is 50,0771 thousand ha. Moreover, the maximum area falls on burnt places.

The subsoil use area accounts for 0.99% of the area of the study area, or 0.9858 thousand ha.

The identified area of industrial forest management occupies 3.32% of the area, or 37,6787 thousand ha. Over a quarter (26.71%) of the total area of the study area, or 303,1207 thousand ha, falls on land without the development of negative phenomena.

The territory of land pollution, storage and burial of industrial waste occupies 0.02% of the area, or 0.2359 ha.

Over a quarter (26.71%) of the total area of the study area, or 303,1207 thousand ha, falls on land without the development of negative phenomena.

The Olkhonsky district is located in the southeastern part of the Irkutsk Region on an area of 1589.502 thousand hectares, adjoins the western shore of Lake Baikal, in its central part, occupying the northern half of the Primorsky Range, the pre-Baikal Lowland and the island of Olkhon. The distance to the regional center is 210 km.

On the lands of the Olkhonsky district, negative processes of natural and anthropogenic origin were identified, occupying 713.8148 thousand ha or about half of the land.

At the same time, the surveys revealed the most extensive areas of changes characteristic of water erosion, occupying more than 64% of the total area of negative changes in areas located on sloping and slightly sloping slopes, which makes up more than a quarter of the region’s territory, or 459.7351 thousand ha (table 2). The average degree of erosion occupies a significant part of the land, about 42% of the total area of the course of this process. A significant degree also accounts for a substantial area - 21.03%.

| №. | Negative processes% | % of negative process from the total area of negative processes | area occupied by the negative process, thousand hectares | % of the negative process of the total area of the district | The degree of development of the negative process,% |
|----|----------------------|---------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------|
| 1  | Water erosion        | 64.41                                                         | 459.7351                                              | 28.92                                                    | 35.91 41.47 22.62                                  |
| 2  | landslide-talus       | 9.7                                                           | 69.2622                                               | 4.36                                                     | 22.08 56.89 21.03                                  |
| 3  | Wind erosion          | 8.14                                                          | 58.090                                                | 3.65                                                     | 10.76 53.56 35.68                                  |
| 4  | Waterlogging          | 2.76                                                          | 19.6774                                               | 1.24                                                     | 63.35 35.15 1.50                                  |
| 5  | Flooding              | 0.77                                                          | 5.5133                                                | 0.35                                                     | 96.7 - 3.3                                       |
| 6  | Eutrophication        | 0.11                                                          | 0.7936                                                | 0.05                                                     | 55.28 44.72 -                                      |
| 7  | Abrasion              | 1.4                                                           | 10.0003                                               | 0.63                                                     | 31.53 42.36 26.12                                 |
| 8  | Production activities | 12.71                                                         | 90.7429                                               | 5.71                                                     | - - -                                            |
| 9  | Subsoil management    | 0.01                                                          | 0.0468                                                | 0.003                                                    | - - -                                            |
| 10 | Industrial forest     | 4.53                                                          | 37.6787                                               | 3.32                                                     | - - -                                            |
| 11 | Storage and disposal  | 0.002                                                         | 0.0139                                                | 0.001                                                    | - - -                                            |
| 12 | Burnt places          | 7.3                                                           | 52.1403                                               | 3.28                                                     | - - -                                            |

The development of landslide-talus processes in most cases on steep slopes occupies 9.7% of the area of negative phenomena, which is 4.36% of the territory of the region, or about 70 thousand hectares.
This phenomenon is predominantly characterized by an average degree of development - about 57%, a fraction of a small and medium degree of less than a quarter.

The region is characterized by the development of wind erosion, which occupies 8.14% of the total area of development of negative changes, which is 3.65% of the study area, or 58,090 thousand ha. Activation of wind erosion occurs as a result of disturbance of the soil cover due to the seasonal influx of tourists. At the same time, a moderate and strong degree of development is characteristic of a negative phenomenon.

The vast area is subject to waterlogging processes in lowered relief forms – 19,677.4 thousand ha, mainly with a weak degree of development. Negative processes of flooding, eutrophication occupy less than 1% of the area.

The studied lands are characterized by a fragmented development of abrasion processes confined to the shoreline of Lake Baikal, occupying 10,003 thousand ha. At the same time, the average degree of development of change accounts for 42.36%.

Negative changes associated with production activities are widespread. Anthropogenic changes in territories and disturbed lands of 90,742.9 thousand ha were revealed. The largest area among them is burnt places- 52,140.3 thousand ha.

There are areas for storage and disposal of industrial waste, and land pollution on 0.0139 thousand ha.

In the studied area of land, those not subject to the development of negative processes occupy more than 55% of the total area of the district.

As a result of the research conducted in the Irkutsk and Olkhon districts, the following negative processes have been revealed:

- water erosion, which occupies the largest area of the studied territories of districts;
- vast areas with landslide-talus processes;
- wind erosion, characteristic of the Olkhon region, due to disturbance of the soil cover;
- waterlogging, flooding, eutrophication typical for the studied territories, saturation is characteristic of the Irkutsk district, due to the close occurrence of groundwater;
- abrasion, related mainly to the shoreline of Lake Baikal;
- disturbed lands as a result of mining activities, exploration, construction, and forest management;
- storage and disposal of industrial waste and land pollution.

The detected negative changes lead to the destruction of the soil cover, and as a result, the development of water and wind erosion, the formation of ravines, violation of the hydrological regime of the area, littering with waste from production and consumption, have a negative impact on the state of land [6, 7, 8]. Based on the results of the research, scientific evidence updated on the quality of land makes it possible for state authorities and local governments, enterprises and citizens to prevent and eliminate the spread of negative processes through improvement and restoration measures.

References
[1] Varlamov A A, Galchenko S A and Antropov D A 2018 Role of cadastres and land monitoring in information support for land management Land management, cadastre and land monitoring 12(167) 5-10
[2] Makhotlova M Sh, Kardanova D E, Ermolaeva M X and Shanibov A A 2019 The role of state monitoring land in the information support of state land management Moscow Economic Journal 2 48-53
[3] Makhotlova M Sh, Nakova L V and Mirzoeva N M 2016 Land monitoring and land management - measures to study the state of land Moscow Economic Journal 2 45-51
[4] Borodina O and Gvozdeva O 2016 Monitoring of natural resources as information basis for accounting and assessment of natural resources Moscow Economic Journal 3 69-75
[5] Boyko P D and Filippova T A 2013 State monitoring of land and its relationship with other subsystems of state environmental monitoring *Omsk Scientific Herald* **1(118)** 257-60
[6] Bayanova A A 2018 Environmental problems and disturbed lands during coal mining in Irkutsk region *Monitoring Science and technology* **3(45)** 59-62
[7] Bayanova A A 2018 Analysis of the burning of forest resources of the Irkutsk region *Astrakhan Bulletin of Environmental Education* **2(35)** 35-8
[8] Bayanova AA 2018 Monitoring of restoration of disturbed lands in the Irkutsk region *Astrakhan Bulletin of Environmental Education* **44** 95-9