RATIONAL LAND USE AS A FACTOR OF NATURAL SOIL COVER CONSERVATION

Nadezhda I. Dobrotvorskaya [1], **Alexey V. Dubrovsky** [2]

[1] Siberian Research Institute of Soil Management and Chemicalization of Agriculture**,** Russian Academy of Agricultural Sciences, Russian Federation
dobrotvorskaya@mail.ru
[2] Siberian State University of Geosystems and Technologies, Russian Federation
avd5@ssga.ru

KEYWORDS: pollution of soil, land conservation, rational land use, soil contamination prevention

ABSTRACT
The issues of soil cover conservation are considered. Classification of soil technogenic pollution types is presented. Interrelation of the concepts of "land conservation", "rational land use" and "environment protection" is shown. Main directions of environmental protection of settlements are emphasized.

Issues of territorial management and rational land use are significant for meeting the requirements of ecological and land legislation. The concepts of sustainable development and priority development of territories are to embrace various factors of natural and anthropogenic environment determining ecological state of the territory. With regard to cadaster, territorial planning and land use, special attention should be paid to the soil cover. The state and quality of soil cover determine the directions of land management. The higher is the soil productivity the more valuable it is, for example, for agricultural use. Contaminated soils with progressing negative processes resulting from different types of technogenic pollution have low cadastral value and are not investment - attractive. The example of technogenic pollution is shown in Figure 1.

General classification of soils technogenic pollution types is shown in Figure 2 [1-2].

a)   b)

Figure 1: Photo examples of land technogenic pollution: a) pipe-line breakage; b) Norilsk territory
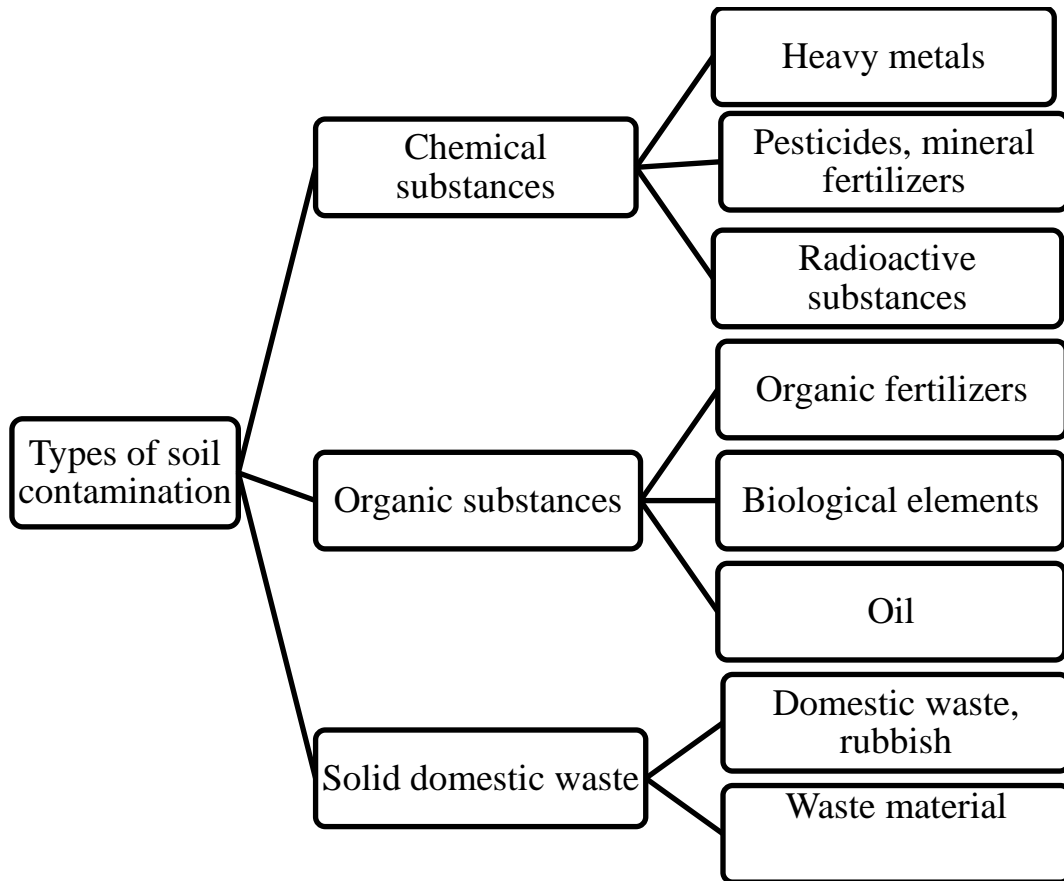
Figure 2: Classification of technogenic soil pollution types

Classification of technogenic soil contamination types allows for determining main contamination pathways to soil.

Technogenic soil pollution is one of its most dangerous types, as chemical substances penetrating the soil are absorbed by plants forming the food chain when they enter the human body [3, 4]. In this connection, it is important to determine the soil contamination threat criteria (Figure 3).

In terms of hygiene, the threat of soil chemical pollution is determined by the level of its possible negative effect on food, contacting media (air, water) and directly on man as well as on the biological activity of the soil and its self-purification processes.
The threat of soils chemical pollution is evaluated separately for different soils (different land-use types). The assessment is based on two basic points [3]:
     - Economic use of territories (settlements soils, agricultural lands, recreation zones, etc.);
     - Most significant (for the territories under study) exposure pathways of contaminated soil to man.
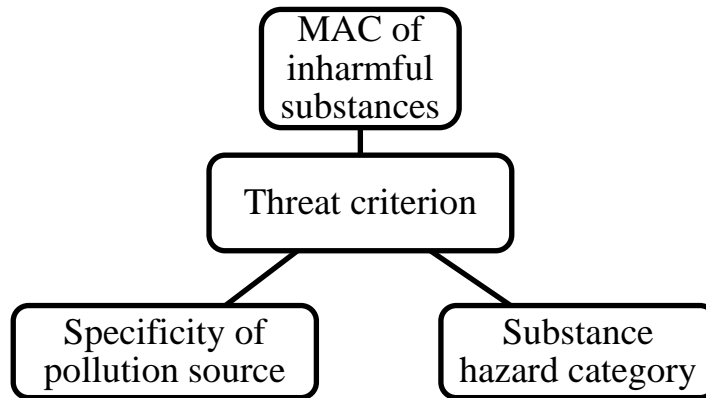
Figure 3: Soil pollution threat criteria

Rational use and conservation of settlements lands are interrelated concepts as under the condition of current urbanization any type of economic land-use is accompanied by the harmful environmental effect (Figure 4) [5, 6].
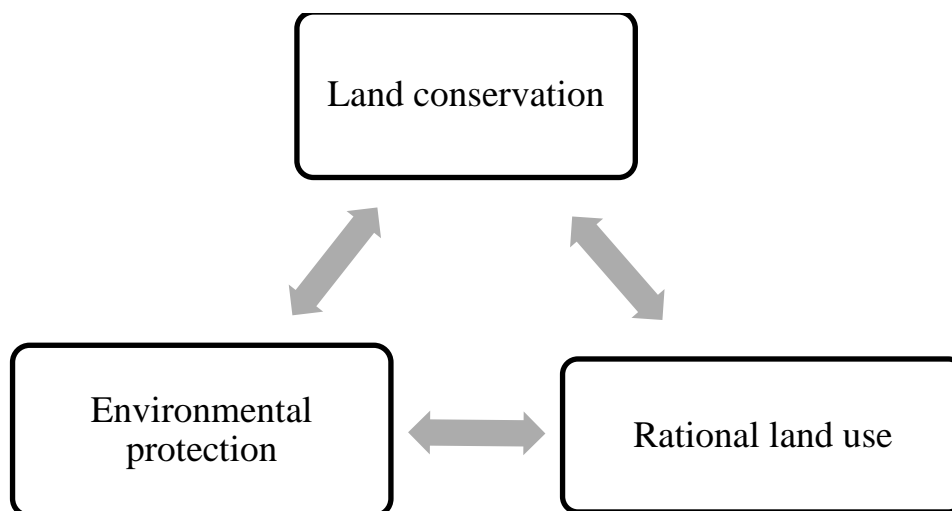

Figure 4: Interrelationship of concepts "land conservation", "rational land use" and "environmental protection"

Environmental protection of cities and settlements includes several directions, with their priorities and contents for certain territories being determined by the environment conditions, economic situation and the level of ecological-and-legal culture of the land-relations subject [7-8]. When developing the system of land conservation measures one should take into account anthropogenic "stress resistance" of the soil cover. In different soil types, accumulation and neutralization of harmful elements show up in different ways. For example, in case of radiation pollution with cesium-137 the process of self-purification is the fastest in black earth and gray forest soil, with sod-podzol soils being inclined to long-term accumulation of radioactive substances. The accumulative effect of negative factors on soils has not been

adequately investigated as yet. There is hardly any scientific forecast for the soils under permanent anthropogenic pressure. The forecast for the settlements soils should be primarily aimed at the evaluation of ecological comfort for the population distribution.

In process of assessment, the following conditions are to be taken into account:
- Natural factors have evident time and space regularities which are easy to assess and allow for forecasting their effect on soils;
- In case of simultaneous effect of several negative factors, anthropogenic impact and synergetic character of the factors are difficult to assess.

Evaluation of the ecological comfort of population distribution is important as its results determine cadastral value of the lands.

Scientific forecasts for the level and character of negative factors impact should be used for correcting the monitoring system. In particular, modern remote sensing systems are to be used on the territories with forecasted deterioration of the soils ecological properties and fertility fall. Moreover, geobotanical point research is required for the areas mostly exposed to anthropogenic impacts [9-11].

REFERENCES

1. Ivlev, A.M. Soil evolution. [Text] / A.M. Ivlev - Vladivostok, 2005.

2. Reshotkin, O. V. Ecological features of urban soils [Text] / O. V. Reshotkin, O. I. Khudyakov // Problems of Regional Ecology.– 2007.- № 2 - P. 6-10.

3. Korolev, V.A. Monitoring of geological environment: textbook [Textт] / V.A. Korolev; edited, V.T. Trofimova. – M: Stroyizdat, 1981. – P. 24 – 40.

4. Akumov, A.I. Environment conditions and population sickness rate in Novosibirsk [Text] / A.I. Akumov, I.F. Mingazov - Novosibirsk: "Nauka", 1999. P. 52-53.

5. Karetina, I.P. Place of retrospective maps of settlements soil cover in cartographic products classification [Text] / I.P. Karetina – Vestnik SGGA № 3 (23), 2013 – P. 138-147.

6. Larionov, Y.S. Alternative approaches to current agriculture and growing soil fertility (new paradigm) [Text] / Y.S. Larionov –Vestnik SGGA, № 1 (21), 2013 – P. 49-61.

7. Dubrovsky, A.V. Experience of creating digital soil maps for the territory of Novosibirsk region [Text] / A.V. Dubrovsky, V.A. Seredovich, К.S. Baikov – Information technologies, systems and instruments in agro-industrial complex. P.2: proceedings of 4th International scientific and practical conference "Agroinfo-2009". – Novosibirsk, 2009. – p. 2. – P-81-86.

8. Dubrovsky, A.V. Experience of using geoinformation technologies for designing the systems for adaptive-landscape agriculture on Novosibirsk region territory [Text] / A.V. Dubrovsky, E.S. Trotsenko / Interexpo GEO-Siberia -2012. VIII International scientific congress, 10-20 April 2012, Novosibirsk: International scientific congress "Economic development of Siberia and Far East. Environmental economics, land management, forestry, real property management": collected materials, 4 vol. Vol. 3. – Novosibirsk: SGGA, 2012. – P. 64-68.

9. Dubrovsky, A.V. Application of adaptive landscape land information systems under conditions of risk farming [Text] / A.V. Dubrovsky, N.I. Dobrotvorskaya - Proceedings of higher education establishments, unit: Geodesy and Aerial Survey № 4/c. – M.:MIIGAIK, 2013. – P. 152-155.

10. Dubrovsky, A.V. Structure of geoinformation support and agro-ecological land use under conditions of risk farming [Text] / N.I. Dobrotvorskaya, A.V. Dubrovsky, C. Y. Trotsenko, S. Y. Kapustyanchik - Interexpo GEO-Siberia -2014. X International scientific congress, 8-18 April 2014, Novosibirsk: International scientific congress "Economic development of Siberia and Far East. Environmental economics, land management, forestry, real property management": collected materials, 2 volumes, Vol. 2. - Novosibirsk: SGGA, 2014. – P. 64-73.

11. Dubrovsky, A.V. The problem of creating plans for development of Novosibirsk agglomeration inter-settlement territories [Text] / A.V. Dubrovsky, N.I. Dobrotvorskaya – International scientific congress "Economic development of Siberia and Far East. Environmental economics, land management, forestry, real property management": collected materials 4 volumes, Vol. 3. – Novosibirsk: SGUGIT, 2015 – P. 106-113.

CONTACT:

Dr. Nadezhda I. Dobrotvorskaya
Head of Laboratory for Rational Land Use
Siberian Research Institute of Soil Management and Chemicalization of Agriculture
Russian Academy of Agricultural Sciences
Krasnoobsk 630501, Novosibirsk Region
Russian Federation
Tel.: +7 (383) 348-06-55
E-mail: dobrotvorskaya@mail.ru

Dr. Alexey V. Dubrovsky
Head of Research and Development Centre "Digitizer"
Siberian State University of Geosystems and Technologies
10 Plakhotnogo St.
Novosibirsk, 630108
Russian Federation
Tel.: +7 (383) 361-01-09
E-mail: avd5@ssga.ru