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**Iraida Kirilchuk**
PhD (Engineering),
Associate Professor of the Department of Labour Protection and Environment,
Faculty of Economics and Management,
Southwest State University
94, 50 Let Oktyabrya Str., Kursk, 305040, Russia
iraida585@mail.ru
ORCID ID: https://orcid.org/0000-0001-8636-9340

**Valentina Rykunova**
PhD (Economics),
Associate Professor of the Department of Economic Security and Taxation,
Faculty of Economics and Management,
Southwest State University
94, 50 Let Oktyabrya Str., Kursk, 305040, Russia
valentina0209@mail.ru
ORCID ID: https://orcid.org/0000-0003-1875-0152

# Unauthorized dumps: socio-economic aspects of the problem

**Abstract.** Russian economy is characterized by extremely large amounts of waste generation and this problem poses a real threat to the sustainable development of the country. In the European part of Russia, despite its breadth, the area of free land is limited and in some cases it is not available at all. This limits the storage and disposal of waste and creates prerequisites for the mass spread of illegal dumping and emergence of unauthorized dumps. It is very problematic to identify a person responsible for the occurrence of dumps and bring this person to justice because such dumps are often without ownership. Citizens-violators pay a fine of no more than EUR 35 in case of proven violation.

Our research is devoted to the development of scientifically proved approach to increasing liability for this environmental offence with regard to the socio-economic aspects of the problem. Proposed and tested method for calculating a fine for the occurrence of unauthorized dumps takes into account its environmental and social danger. It is aimed at economic stimulation of environmentally responsible behaviour, as the increased amount of fine will contribute to elimination of unauthorized dumps by the land owners.

In addition, the Internet portal has been created by the authors which allows the citizens to put the places of detected unauthorized dumps on an interactive map. It can also automatically generate an application to the appropriate authority and assess the environmental danger of a discovered dump and the amount of fine for its occurrence.

**Keywords:** Unauthorized Dump; Illegal Dumping; Waste; Waste Disposal Facility; Public Administration; Environmental Liability; Social and Ecological Danger; Fine

**JEL Classification:** M41; Q57

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**Кирильчук І. О.**
кандидат технічних наук, доцент кафедри охорони праці та навколишнього середовища,
Південно-Західний державний університет, Курськ, Російська Федерація
**Рикунова В. Л.**
кандидат економічних наук, доцент кафедри економічної безпеки та оподаткування,
Південно-Західний державний університет, Курськ, Російська Федерація

**Стихійні несанкціоновані звалища: дослідження соціально-економічних аспектів проблеми**

**Анотація.** Російська економіка відрізняється надзвичайно великими обсягами утворення відходів, і ця проблема представляє реальну загрозу сталому розвитку країни. У європейській частині Росії, не дивлячись на її розлогість, площа вільних земель лімітована, а в деяких випадках вони взагалі відсутні. Це обмежує місця зберігання та захоронення відходів і створює передумови для масового поширення нелегального скидання відходів і виникнення стихійних несанкціонованих звалищ. Як правило при виникненні таких звалищ на земельних ділянках, що не мають власника, дуже проблематично встановити особу, винну в їх виникненні, й притягнути її до відповідальності, а в разі доведеного складу порушення порушникам – фізичним особам зазвичай загрожує штраф у розмірі не більше 35 євро.

У зв'язку з цим у даному дослідженні була вирішена актуальна задача, що полягає в розробці науково обґрунтованого підходу до посилення матеріальної відповідальності за вказане екологічне правопорушення, беручи до уваги соціально-економічні аспекти проблеми. Запропонований та апробований авторами метод розрахунку штрафу за виникнення стихійного несанкціонованого звалища враховує його екологічну й соціальну небезпеку та являє собою напрямок економічного стимулювання екологічно раціональної поведінки, позаяк збільшена сума штрафу сприятиме оперативній ліквідації несанкціонованих звалищ власниками земель.
Окрім того, автори розробили Інтернет-портал, який дозволяє громадянам розміщувати місця виявлених несанкціонованих звалищ на інтерактивній карті. Він також може автоматично подати заявку до відповідного органу влади й оцінити екологічну небезпеку виявленого звалища, а також суму штрафу за його створення.
**Ключові слова:** несанкціоноване звалище; нелегальне скидання відходів; відходи; державне управління; відповідальність за екологічне правопорушення; соціально-екологічна небезпека; штраф.

**Кирильчук И. О.**
кандидат технических наук, доцент кафедры охраны труда и окружающей среды,
Юго-Западный государственный университет, Курск, Российская Федерация
**Рыкунова В. Л.**
кандидат экономических наук, доцент кафедры экономической безопасности и налогообложения,
Юго-Западный государственный университет, Курск, Российская Федерация
**Стихийные несанкционированные свалки:**
**исследование социально-экономических аспектов проблемы**
**Аннотация.** Российская экономика отличается чрезвычайно большими объёмами образования отходов, и эта проблема представляет реальную угрозу устойчивому развитию страны. В европейской части России, не смотря на её обширность, площадь свободных земель лимитирована, а в некоторых случаях они и вовсе отсутствуют. Это ограничивает места хранения и захоронения отходов и создаёт предпосылки для массового распространения нелегального сброса отходов и возникновения стихийных несанкционированных свалок. Зачастую при возникновении таких свалок на земельных участках, не имеющих собственника, весьма проблематично установить лицо, виновное в их возникновении, и привлечь его к ответственности, а в случае доказанного состава нарушения нарушителям – физическим лицам обычно грозит штраф не более 35 евро.
В связи с этим в данном исследовании была решена актуальная задача, состоящая в разработке научно обоснованного подхода к ужесточению материальной ответственности за указанное экологическое правонарушение, принимая во внимание социально-экономические аспекты данной проблемы. Предложенный и апробированный авторами метод расчета штрафа за возникновение стихийной несанкционированной свалки учитывает ее экологическую и социальную опасность и представляет собой направление экономического стимулирования экологически рационального поведения, так как возросшая сумма штрафа будет способствовать оперативной ликвидации несанкционированных свалок собственниками земель.
Кроме того, авторы разработали Интернет-портал, который позволяет гражданам размещать места обнаруженных несанкционированных свалок на интерактивной карте. Он также может автоматически подать заявку в соответствующий орган власти и оценить экологическую опасность обнаруженной свалки, а также сумму штрафа за ее создание.
**Ключевые слова:** несанкционированная свалка; нелегальный сброс отходов; отходы; государственное управление; ответственность за экологическое правонарушение; социально-экологическая опасность; штраф.

## 1. Introduction

The history of society development is inextricably connected with the problem of increasing volumes of waste. It is possible to say that every large city is on the verge of toxicological poisoning with its own waste.

G. M. Batrakova, S. V. Maksimova and I. S. Glushankova (2003) note that systematic situation of untimely removal of garbage, its placement and burial in environmentally unsafe dumps leads to the deterioration of epidemiological situation in adjacent territories, and the spread of pathogenic microorganisms. It leads to a sharp increase in the number of population suffering from various infectious diseases. According to A. S. Yakovlev (2007), it can be concluded that most waste disposal facilities (landfills, unauthorized and authorized dumps) not only pollute all environmental objects without exception but also exert overwhelming psychological pressure, forming extremely unfavourable life environment. Each year more than 10,000 hectares of land suitable for use in Russia are removed from economic circulation for the organization of authorized places for solid municipal wastes, apart of huge areas of land occupied by illegal dumps. In addition, wastes buried in dumps and landfills contain many valuable components that could be disposed. For example, according

to the calculations made by B. V. Boravsky and V. V. Zhukov (2013), metals extracted from solid wastes can provide Russian industries with iron for 7%, aluminium - for 8%, tin - for 19%.

## 2. Brief Literature Review

Studies by E. Markvart (2003), M. Caniato, T. Tudor and M. Vaccari (2015), T. D. Farmer, P. J. Shaw and I. D. Williams (2015) show that the impact of new political and ideological attitudes, especially in developed countries, has caused radical changes in solid waste management in recent decades. The system of waste management in developed countries is complex-integrated, including socio-economic and regulatory components. The principle of sustainable development is the main principle on which it is based (Back, 2018; Dahl, 2018; Matsuto, 2017).

Economic instruments used in waste management system are of particular interest in this research. One of the most effective tools is the principle: «As much you throw away, as much you pay». It implies payment for the services of specialized organizations for the transportation, processing and disposal of generated waste based on their weight.

Taxation is another economic instrument which is common in developed countries. Thus, in EU countries, taxes have been imposed on transportation and disposal of waste. In addition, high cost of imported crude oil has led to the recycling of all oil-containing wastes in the European countries. Primary oil-containing products are subjected to taxes, and revenues are used to subsidize recycling enterprises. In the USA, paper manufacturers are entitled to preferential loans which are used to modernize production and increase recycling of paper waste. Germany has «take-back» principle, which implies the responsibility of manufacturers to dispose their products (including packaging) after they lose their consumer properties. It should be noted that the «take-back» principle was adopted by Russia when environmental fee was introduced in 2015.

Most developed countries have a system for promoting the use and consumption of recycled (or secondary) resources, which includes tax incentives for enterprises producing recycled materials from one hand and demand from the other hand. In Switzerland, for example, hotels and shopping centres must pack waste only into bags from the recycled materials and which are sold by municipalities with additional profits. This obligation is set at the legislative level.

As it is noted in EEA Report No. 2/2013, «Managing municipal solid waste - a review of wastes in 32 European countries» (EEA, 2013), the more developed a country is, the less waste it buries, and a significant amount of waste is recycled, reused and composted (Figure 1).

D. Hoornweg and P. Bhada-Tata (2012) reasonably argue that effectiveness of waste management system correlates with the average income of population in the country.

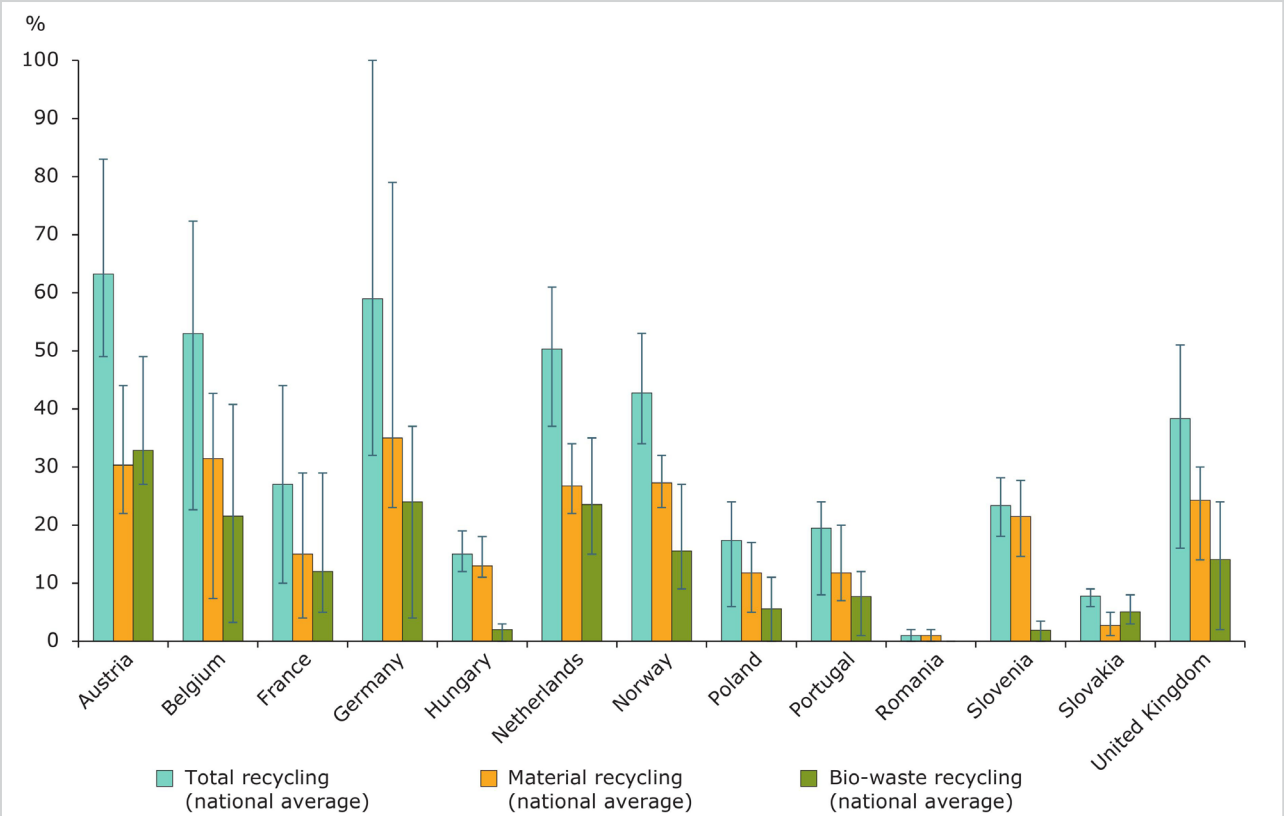
However, no final solution to waste problem has been found abroad. As K. J. Whiting and F. J. Schwager (2007) note, most incinerators in the world, including high-efficient plants in Sweden and Japan, produce huge amounts of toxic ash and dust. The problem of its disposal is currently unresolved. In addition, according to studies by J. G. Rubio (2007), Z. R. Koltai (2007) and A. Koenig (2007), unauthorized placement of garbage is an up- to-date problem in many countries.

Thus, in most developed countries, the problem of waste has been solved for decades but in Russia this problem has never been a priority task due to a vast territory and illusory perceptions of possibility of unlimited waste disposal. The researches by V. Devyatkin (2007) and N. G. Gladyshev (2007) show features of waste management system in Russia. Almost all volume of generated solid household waste is buried in dumps and sites, 88% of which were already in «unsatisfactory sanitary condition» in 1989.

Russian economy is extremely high in waste generation and this problem is getting worse now. According to A. A. Kazdym (2010), the current situation in the Russian Federation in the field of waste management leads not only to inefficient use of resources, accompanied by significant pollution of social environment, but also poses serious threat to sustainable development of the country.

Analysis of studies by N. F. Abramov, A. N. Mirny, B. M. Spassky (2003), T. V. Alexandrova (2007), I. P. Belyaev, I. A. Solomin, A. N. Udaltsov (2004) allows identifying the factors affecting the waste management system formation in the Russian Federation in past and present as following:

- the gaps in environmental legislation and lack of land ownership have affected the low cost of waste disposal;
- the extensive development of consumption-oriented economic system has not contributed to the efficient use of resources;
- the secrecy of many scientific developments caused information vacuum in the field of efficient waste management.




Note: The variation bar shows the highest and lowest regional recycling level within each country. 2008 data were used for Belgium, Germany, France, Hungary, Slovenia and Romania. 2009 data were used for the rest of the countries.

Figure 1:
**Regional variation in municipal waste recycling rate in 13 countries, 2008/2009**
Source: Eurostat, 2012 (cit. by EEA, 2013)

At the same time, high-tech products of developed industrial society are currently being produced, imported and consumed in Russia. As a result, the composition of generated wastes is becoming more sophisticated and their quantity is increasing at a very significant rate.

It should also be noted that the number of specially adapted places for the placement of municipal solid waste (MSW dumps) «are 1092 all over the country. This is less than even the number of authorized dumps (13 000 dumps).» According to data available to the Federal Service for Supervision of Natural Resource Usage, «the design capacity of dumps is lower than the established annual standards of waste accumulation in 45% of entities of the Russian Federation» (Sokolova, 2018).

In the European part of Russia, despite its breadth, the area of free land is limited and in some cases it is not available at all. According to E. A. Kotelnikova and O. B. Zaytsev (2012), this fact limits the storage and disposal of waste and creates prerequisites for the mass spread of illegal waste dumping on soils and waters with serious environmental and sanitary consequences.

According to the Ministry of Natural Resources and Environment, in 2017 the Federal Service for Supervision of Natural Resource Usage identified more than 23 thousand objects of unauthorized waste disposal, and eliminated about 15 thousand (Ministry of Natural Resources and Environment of the Russian Federation, 2019).

The relevance of the presented problem is based not only on statistics but also on the following aspects:

- the volume of MSW increases not only in absolute figures but also per capita. However, in many regions the rates of municipal waste accumulation have remained since Soviet times. Consequence of understatement of waste accumulation standards per person is lack of territory with required infrastructure for environmentally safe waste management system, connected with critical shortage of containers, sites of temporary MSW placement, special motor transport;

- the toxic components have increased dramatically in municipal waste;
- the cost of waste recycling is many times higher than the cost of disposal;
- there are a huge number of waste disposal facilities that do not meet environmental standards and requirements. However, most local budgets lack funds to eliminate dumps or arrange them according to the requirements of the legislation of the Russian Federation;
- the low level of environmental education of the population and peculiarities of the Russian mentality do not contribute to the development of an effective MSW management system based on separate garbage collection in the country.

It should be noted that due to critical impact on the society of waste generated by the population the fact that amount of MSW removal from residential areas is about 1% of wastes of all annual production and consumption (Sergeenkov, 2015).

Unauthorized dumps are the consequence of the destruction of societal ecological culture. It should be noted that dumps are arranged not only in close proximity of houses which do not have garbage containers but also in close proximity of garage cooperatives. They are also arranged on land of agricultural use, forestry, water landscape and adjacent land. These facts show the need for this problem solution on the basis of socio-economic factors.

Studies by P. V. Voronin et al. (2015, 2016) have focused on improving the efficiency of public waste management, including administrative regulation and economic incentives. But he pays insufficient attention to the relation between social, economic and environmental aspects of the problem (Voronin, Pavlenkov, & Maeva, 2015; Voronin, Pavlenkov, & Zhuravleva, 2015; Voronin, Pavlenkov, & Larionov, 2016). An attempt to implement integrated assessment of environmental costs of ecological, economic and social factors in the post-Soviet territory, taking into account the influence of additional factors in different regions, is described by O. V. Shkarupa and M. O. Kharchenko (2017).

## 3. The Purpose

**The Purpose** of the paper is to develop directions for improving public waste management of unauthorized dumps, taking into account socio-economic aspects of the problem.

## 4. Results

One of the tools of public administration in the field of unauthorized dumps is an administrative liability, including the material one, and the liability for environmental offence.

Measures of liability for violation of environmental legislation in waste management are stated by the Code of Administrative Offences of the Russian Federation (State Duma of the Russian Federation, 2001-2019). Table 1 shows existing fine system in the Russian Federation.

Analysis of the existing fines shows that fine calculation for an unauthorized dump does not take into account its environmental and social danger. Thus, formulation of a differentiated system of fines imposed on those who arrange unauthorized dumps is topical.

Table 1:
**Liability for violation of waste management legislation in Russia**

| Violation of environmental legislation | Liability measures, EUR | | | |
|---|---|---|---|---|
| | citizens | officials | persons carrying out business activities not being a legal entity | legal entities |
| Article 8.2. Noncompliance with environmental, sanitary and epidemiological requirements in production and consumption waste management | 15-30 | 150-450 | 450-750 | 1500-4000 |
| Part 2 of the Article 8.6. Damage of lands | 20-35 | 45-60 | 45-60 | 450-580 |
| Part 5 of the Article 8.13. Violation of water protection rules | 30-35 | 60-70 | - | 580-730 |
| Article 8.19. Violation of waste and other materials dumping rules in inland sea waters, in territorial sea, on continental shelf and/or in the exclusive economic zone of the Russian Federation | - | 15-20 | - | 2900-4350 |
| Part 2.3 of the Article 8.31 Pollution of forests with wastewater, chemical, radioactive and other harmful substances, production and consumption wastes and/or other negative impacts on forests | 15-35 | 30-70 | 30-70 or administrative suspension of activities for up to 90 days | 300-1500 or administrative suspension of activities for up to 90 days |

Source: Compiled by the authors based on the Code of Administrative Offences of the Russian Federation (State Duma of the Russian Federation, 2001-2019)

Prompt detection and initial registration of unauthorized dumps arranged in the city territory is carried out using the Internet portal http://dev.swsu.ru developed for Kursk city of Russia with our participation. The peculiarities of work with this Internet resource are presented in works by V. V. Yushin and I. O. Kirilchuk (2017), V. V. Yushin, V. M. Popov, I. O. Kirilchuk and A. V. Gnezdilova (2018).

In the portal administrator mode, environmental and social hazard of landfill is assessed according to the method formulated by us. It can be done by calculating the hazard level of unauthorized dump K analysing the following parameters:

$$K = K(S, C, L, V_f, T), \quad (1)$$

where:
$S$ is the area of an unauthorized dump, m$^2$;
$C$ is the composition of the placed wastes;
$L$ is the distance from the dump to the places of population activity, water infrastructure and specially protected natural territories (SPNR), m;
$V_f$ is the amount of dump filtration water, m$^3$/year;
$T$ is the period of waste placement in the dump territory, years.

Table 2 shows the compliance of the specified above parameters with the dump hazard level.

Table 2:
**The environmental hazard level of unauthorized dump identification**

| *K* | *S*, m$^2$ | *C*, % | *L*, m | *T*, years | $V_f$, m$^3$/year |
|---|---|---|---|---|---|
| I– extremely hazardous | >20 | Food waste, rubber, plastic | <50 | >2 | >15 |
| II– highly hazardous | 15<S<20 | Paper, metal | 50< L<100 | 1.5<T<2 | 10<$V_f$<15 |
| III– moderately hazardous | 10<S<15 | Textile, wool | 100< L<200 | 1.5<T<2 | 10<$V_f$<15 |
| IV – low-hazardous | 5<S<10 | Timber, leather | 200< L<300 | 1<T<1.5 | 5<$V_f$<10 |
| V – virtually non-hazardous | S<5 | Brick/stone | L>300 | T<1 | $V_f$<5 |

Source: Formulated by the authors

Identification of the environmental hazard level of unauthorized dump is as follows: actual characteristics of a dump are compared with the tabular ones. The dump has a hazardous level I if three or more parameters from the actual indicators match the indicator from the first line. If there are no matches in the first line, we go to the second, then to the third one, etc.

After determining environmental hazard level of the dump, a fine for its occurrence is calculated:

$$F = P(K) * D, \quad (2)$$

where:
$F$ is a fine for the occurrence of the unauthorized dump;
$P(K)$ is a weighting factor depending on environmental hazard level of a dump (if $K = 1$, then $P(K) = 5$; if $K = 2$, then $P(K) = 4$; if $K = 3$, then $P(K) = 3$; if $K = 4$, then $P(K) = 2$; if $K = 5$, then $P(K) = 1$);
$D$ is the damage for soil as an object of the environment, rubles (Rekus & Shorina, 2001) or Euros (in our approbation).

Sanitary and hygienic survey of one of the districts of Kursk city was carried out between September and December 2019. We tested the proposed approach of differential calculation of fines for the occurrence of unauthorized dumps. As a result of this survey, more than 50 unauthorized dumps were found.

A fine was calculated for each of the found dumps with the help of special software and data of the Internet portal http://dev.swsu.ru.

«Report on evaluation of unauthorized dumps» has been formed as a result of software modules implementation. Figure 2 shows an example of this report.

It should be noted that maximum fine according to legislation for all found dumps does not exceed EUR 1,500. While the total penalty calculated by using approach proposed in this research will be more than EUR 4,000.

| | |
|---|---|
| Address of a dump | Kursk, Khruscheva str. |
| Picture |  |
| Size of a dump, $m^2$ | 4 |
| Height of a dump, m | 0.2 |
| The shape of a dump | Parallelepiped (waste are in a thin layer) |
| Waste composition | Timber, leather products, bricks/stones |
| Distance from places of human activity, water bodies and SPNR, m | 300 |
| Lifetime of a dump, years | Less than a year |
| Surface on which the dump is located | Surfaces covered with grass and shrubs |
| Dump status (it is found / it is liquidated) | found |
| Hazardous level | 4 |
| Fine, EUR | 100 |

Figure 2:
**Assessment report on unauthorized dumps**
Source: It is calculated by the authors

## 5. Conclusions

It is very problematic to identify a person responsible for the occurrence of dumps and bring to justice because such dumps are often without ownership. Undertaken research develops the scientifically proved approach to increasing liability for this environmental offence, taking into account socio-economic aspects of the problem. Proposed and tested method for calculating a fine for the occurrence of unauthorized dump takes into account its environmental and social danger. The increased amount of fine will contribute to the elimination of unauthorized dumps by land owners.

In addition, the Internet portal was created in order to improve the system of detection and elimination of the unauthorized dumps and to draw attention to the problem of sanitary cleaning of the city not only by volunteers' organizations but also by the state executive bodies. This Internet portal allows citizens to put places of detection of unauthorized dumps on an interactive map. It can also automatically generate an application to the appropriate authority responsible for the sanitary condition of the site where the dump was found. This application, prepared according to a form, in addition to mandatory information, contains information about environmental danger of a discovered dump and the amount of fine for its occurrence. Automatic formation of the application will speed up the process of notifying discovered dumps by the authorities. And, as a result, it can reduce the time of its liquidation.

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