

Social Aspects of Land Degradation from the Viewpoint of Experts of the Scientific Community

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Abstract—Land degradation is a global problem of mankind, the greatest contribution to which belongs to aridity and soil erosion. The social consequences of land degradation are extremely important, but poorly conceptualized issues. This makes it difficult to create effective research programs to study them. The article provides an overview of the issues under consideration. An expert study was conducted to identify a problem field in the field of studying the social consequences of land degradation. By interviewing nine recognized scientific experts in the field of land degradation studies, the most reliable judgments were identified, which served as a basis for highlighting the main forms of manifestation of the social consequences of land degradation. Private research concepts were compiled, which consist in highlighting the position of each expert on the main consequences of land degradation. As a result, a generalized expert model of the problem field of the social consequences of land degradation was formed. According to the model all experts note the interdisciplinary nature of the study of the issues under consideration, which are placed at the intersection of environmental, economic, and social problems. The overwhelming majority of experts noted the direct nature of the effect of land degradation on the formation of social consequences. Thanks to the integration of individual ideas, it was possible to identify characteristics for which there are discrepancies. This provides an opportunity for a broader study of the social consequences of land degradation. However, there is an expert opinion that the social consequences are rather indirect and are realized through resource problems. Some experts draw attention to the fact that there are the extreme forms of land degradation that significantly increases the manifestation of social consequences. According to experts, land degradation can lead to change in social status, a decrease in the recreational potential of land, hunger, a change in life expectancy and loss of jobs, increased stratification of society, changes in the cost of housing and a change in the type of land use, reduction in the use of land for agricultural needs, and changes in people's attitudes to more individualistic ones. It was also noted that the use of products from degraded lands could lead to an increase in cancer incidence in the region. Conceptualization and identification of these problems could help to focus efforts in the field of studying the social problems of land degradation.

Keywords: soil degradation, aridity, soil erosion, land use, sustainable development, social consequences, expert knowledge

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INTRODUCTION

Land degradation is one of the most important global problems of our century, having a negative impact on soil productivity, the environment, food security, and quality of life. Consequently, the importance of studying land degradation is due to the global nature of its social consequences. The social demand for the development of scientific knowledge in the field of studying land degradation in the world is constantly increasing, which can be illustrated by the example of the 15th sustainable development goal formulated by the UN: “Protect and restore terrestrial ecosystems and promote their sustainable use, sus-

tainable forest management, combat desertification, halt and reverse land degradation and halt biodiversity loss” (*The 17 Goals...*, 2023). It can be easily seen that this goal involves not only studying the problems of land degradation, but also implies the need to find ways to overcome the social consequences of land degradation. Land use issues are currently being actively discussed. Since 2013, the number of published articles on the topic of sustainable land use has grown rapidly (Xie, et al., 2020b). It is noteworthy that, after 2014, the number of publications in the field of land degradation has been growing (Xie, et al., 2020a). At the same time, there is a significant diversity of opinions about the essence and nature of degradation

processes depending on the region, the level of development of the country and the history of the formation of land use culture (Foley et al., 2005; Safriel, 2007; Mohamed et al., 2019). To make sustainable development more effective, it is necessary to take into account each of its three aspects: environmental, economic and social (Barbier, 1987; Arvidsson Segerkvist et al., 2020; Arneth et al., 2021).

The greatest attention is paid to the *environmental component* of land degradation. Právělie et al. (2021), in analyzing the spatial impacts of multiple forms of land degradation, focus on the following five main degradation processes in arable systems: aridity, soil erosion, vegetation reduction, soil salinization, and decrease in soil organic carbon. At the same time, the greatest contribution to land degradation is made by aridity (40%) and soil erosion (20%), and about 7% of the world's arable land is subject to the combined effects of these two processes (Právělie et al., 2021). The impact of land degradation on productivity is due to the decline in land quality at the site where degradation occurs (e.g., erosion) and beyond the site where eroded soils are redeposited. There are estimates showing that the productivity of some lands has decreased by 50% due to soil erosion and desertification. A clear example of significant land degradation is the decline in crop yields in Africa due to soil erosion, which amounted to about 8.2% across the continent, reaching 40% in some cases. It should be noted that the impact of land degradation on local productivity is often masked by the use of additional resources and the introduction of improved technologies, which has even led some researchers to question the negative consequences of desertification (Eswaran et al., 2019). One promising way to analyze the processes under consideration is proposed by Kust et al. (2020), who provide a methodology for assessing the neutral balance of land degradation, which can significantly optimize management decision-making in the field of land use.

The *economic component* of land degradation has also attracted much attention from researchers (Eswaran et al., 2019). For instance, in South Asia, annual yield loss is estimated at 36×10^6 t of grain equivalent, valued at US\$5400 million, due to water erosion and US\$1800 million due to wind erosion. It is estimated that the total annual cost of erosion to US agriculture is about \$44 billion per year, or about \$247 per hectare of cropland and pasture. Globally, the annual loss of 75×10^9 t of soil costs the world approximately US\$400 billion per year, or approximately US\$70 per person per year. Some economists argue that the local impacts of soil erosion and other degradation processes are not severe enough to justify any national or international action plan. However, most researchers are of the opinion that land is a nonrenewable resource in the medium to long term, many of the adverse effects of land degradation are irreversible,

and the masking effect of improved technology creates a false sense of security.

As for the domestic experience in studying the management of sustainable development of agriculture, using the example of the Black Earth Region, it consists not only in the implementation of soil protection measures, but also in adjusting the economic indicators of their agricultural development related to soil degradation and potential climate change (Strokov et al., 2020). This indicates the need, due to the complexity of sustainable development, to take into account the economic component of land degradation for its successful implementation. In turn, assessing the cost of individual properties of soil, soil modifiers, ground, soil-ground, and soil mixtures is the most promising when it comes to approaches to the economic assessment of soils (Makarov et al., 2023). Analysis of agricultural land degradation from an economic point of view can also be carried out by identifying the dynamics of productivity decline (Tsvetnov et al., 2021).

Social aspects of land use and land degradation also come under the consideration of researchers, albeit not so frequently, especially in connection with the agricultural use of land and its economic assessment (Gorelova (Morozova), 2014; Blaikie, Brookfield, 2015; Chupina et al., 2020; Semyachkov et al., 2021; Foley et al., 2005). Most often, work in this area is aimed at identifying the adverse impact of land degradation on local communities and developing additional tools for implementing management measures in the context of environmental management to create conditions for the rational consumption of regional resources, which can help maintain the stability and security of the development of local society while meeting its needs and ensuring high environmental quality.

The actual social consequences of land degradation are not so well analyzed. The authors were unable to find works that clearly formulated the main social consequences of land degradation. One of the closest studies was the work of Martynenko (2020), where the following social consequences of environmental problems are highlighted: new social conflicts and contradictions, intensification of migration processes, barriers to economic growth, rising poverty and declining quality of life, and increasing the burden on the state. Also related in specificity are works devoted to such socioecological phenomena as ecohabitus (Kennedy, Givens, 2019) and LUT (land use transition) (Long et al., 2021), which, if considered as a model of resource development, can lead to colonial environmental violence (Bacon, 2019; Murhaini, Ludang, 2020). Another important concept in the context of the social consequences of land degradation is climate justice, which refers to numerous ethical issues raised by climate change (Dietz et al., 2020; Klinenberg et al., 2020). In turn, poor people, indigenous peo-

ples, communities of color, and developing countries are unequally affected by climate change (Mohai et al., 2009), the latter of which have received significant attention in terms of their ability to adapt to climate change (Fu et al., 2021). In fact, the interaction of society with the environment in the context of natural disasters determines multiple risks (Peek et al., 2021). This brings us directly back to the environmental social consequences, including the social consequences of land degradation.

Summarizing a brief review of scientific approaches to the study of land degradation, we can conclude that, at present, the issue of studying the social consequences of the processes under consideration, which is undeservedly receiving little attention at present, is quite urgent. This situation is partly due to the fact that reliable “benchmarks” and points of contact for various researchers on this issue have not been developed. Below, we present the results of a study of expert opinion on various aspects of the social consequences of soil degradation.

MATERIALS AND METHODS

As can be seen from the above review, the basis of the study of soil degradation is an interdisciplinary approach, which, in particular, is required to achieve the sustainability of the agricultural and food system (El Bilali et al., 2021). This determines the involvement of not only natural science disciplines, but also social and humanitarian ones in the study of land degradation. In this regard, it may be promising to use approaches developed in sociology, which does not describe adverse environmental consequences as such, but rather explains the harm caused by these processes (Lynch, 2020).

Previously (Bondarev, Bolkhovitinova, 2019), the frequency of discussion of the social consequences of catastrophic floods was analyzed, and later (Bondarev, 2022) the scientific interest in this problem was studied in more detail. The following most considered consequences were identified (in descending order of interest): lethal losses, social solidarity, management problems, horizontal mobility, psychological condition, vertical mobility, social conflicts, social adaptation, and loss of health. It can be expected that these same problems, to one degree or another, may be relevant for the social consequences of land degradation. Therefore, the identified groups of social consequences, taking into account the specifics of the subject of research, served as the basis for the corresponding analysis, which made it possible to draw up a conceptual series associated with the study of the social consequences of land degradation and to construct a conceptual research model.

Constant changes in land use conditions and the complication of social interactions in this regard, as well as insufficient formalization of the problem, have

led to the need to address an *expert survey* in the shape of a *semistructured qualitative interview*, where data is collected from a small group of recognized experts in the relevant field. Typically, it is advisable to use qualitative methods to update the problem field, formulate hypotheses, and find common approaches and contradictions. The small sample size does not allow us to fully extrapolate the findings to the entire population of specialists working in this field, but the results obtained can be extremely useful for a deeper understanding of the problem. The chosen method can also help identify the internal motives and motivations of researchers dealing with the relevant problem (Maslennikov, 2001; Mantseva, 2018; Nebolsina, 2018; Maslov, 2020; Bell et al., 2022).

During the study, interviews were conducted with representatives of the scientific community who are directly involved in the study of various aspects of land degradation and who are recognized experts in this field. A total of nine experts took part in the study: two doctors of biological sciences, three doctors of geographical sciences, three candidates of geographical Sciences, and one candidate of agricultural sciences. The experts represented such organizations as Moscow State University (Faculties of Geography and Soil), Timiryazev Moscow Agricultural Academy, Institute of Geography of the Russian Academy of Sciences, and Moscow State Pedagogical University. Each of the respondents was assigned a serial number in order to maintain confidentiality and create a generalized expert model.

Next, five variables were identified that make it possible to characterize particular research concepts using the indicators contained in them. Note that the social component of the variables used is sufficiently reflected in the interpretation of the concepts on which they rely. Based on the above, the following conceptual research model was derived (Fig. 1).

According to Fig. 1, degradation is a source of land use problems, which made it necessary to determine its content and nature. In this situation, the management of land use subjects becomes the next object of study, because it is a moderator of land degradation: an increase, in the case of irrational management, and a decrease, in the case of rational management. Direct management of land resources is implemented through land reclamation. Finally, the actual social aspects of land degradation require separate consideration. Based on the above variables, each interview was divided into five blocks.

RESULTS

As a result of the interviews and their transcription and analysis, it was possible to obtain the following results, which, first, can be illustrated by the most important narratives of various experts, then give specific research concepts, and then create a general

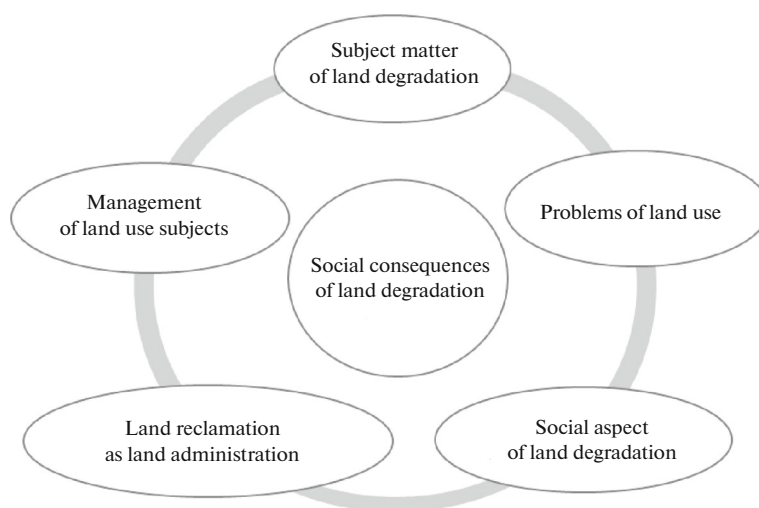


Fig. 1. Structural diagram of an expert study of the social consequences of land degradation.

model of expert knowledge in the field of researching the social consequences of land degradation.

So, let us turn to how the experts themselves see the issues under consideration. In the first block, it should be noted that four experts emphasized the presence of multiple approaches regarding the subject area of land degradation, while each of the experts in one way or another noted the negative nature of the phenomenon.

"...in general, land degradation can be understood as completely different things, because... in addition to fertility, soils have a lot of different other ecological functions that also naturally change..." (Expert no. 4).

It should be noted that despite the apparent unity of approaches to this concept, their different forms are obviously present within the framework of scientific discourse.

Also of interest to researchers is the relationship between land use problems and global climate change and the subsequent socio-economic consequences.

"If we talk about more specific problems related to land use, they are quite broad. These are the problems of forest depletion, these are the problems of reducing the productivity of arable land, these are the problems of pasture degradation, these are very related... the problems of climate change are, as it were, a trigger here... This is if we are talking about natural processes, naturally this is followed by a chain associated with social economic consequences" (Expert no. 8).

Here, we can trace the relationship between land degradation and the previously mentioned climate justice research. This speaks to the importance of considering the climate aspect within the framework of research into the social consequences of land degradation.

Turning to the topic of the impact of improvement or deterioration of land resources on people, two

experts spoke about problems with falling productivity, one expert noted the connection of land degradation with humanity and the type of society, and another expert noted the potential loss of aesthetic appeal of landscapes.

"... some understand a landscape as an area of land, as types of terrain, which also exists, and, probably, they have the right to define landscape in this way. Therefore, I think that in terms of aesthetic perception of a degraded landscape, a person, probably... can also somehow perceive it in his own way. And it will probably not always be positive from the point of view of his perception." (Expert no. 5).

Regarding the problems of reclamation as land administration, four experts focused on the significant impact of the correct choice of reclamation measures, which is often not such a simple task, two experts noted the importance of the economic aspect in the issue of organizing reclamation, two more noted the change in yield. All experts are unanimous that reclamation is the most important element for improving the situation with land degradation, to which more attention should be paid.

Regarding management problems and social responsibility in land administration, four experts noted negative trends, while two experts spoke rather in a positive manner.

"...that is, in a good way, in order for there to be social responsibility, you need to understand what you do, you need to understand what you manage, and for this you probably need to start from Kindergarten; that is, we have a very low level of environmental culture in society and accordingly from top to bottom" (Expert no. 3).

Three experts referred more to the decisive role of external factors than to personal responsibility (legislation, administration). Thus, we can talk about a fairly even distribution of positions on this issue,

Table 1. Generalized expert model of the problem field of social consequences of land degradation

General expert opinion	Private expert opinion	Individual expert opinion
<ul style="list-style-type: none"> • The negative nature of the consequences of land degradation, requiring additional study and attention from scientists and business executives; • Non-mediated (direct) nature of the consequences of land degradation • The formation of the social consequences of land degradation is determined by environmental, economic, and social problems and combination thereof 	<ul style="list-style-type: none"> • The indirect nature of the consequences of land degradation is manifested through resource problems (concept nos. 1 and 4); • Highlighting extreme forms of land degradation as an additional significant factor influencing social consequences (concept nos. 3 and 4); • Land degradation can lead to: • Change in social status (concept nos. 3 and 8); • Reducing the recreational potential of lands (concept nos. 3 and 7); • Hunger (concept nos. 5 and 8); • Changes in life expectancy (concept nos. 2 and 7); 	<ul style="list-style-type: none"> • Land degradation can lead to: • job loss (concept no. 2); • increasing stratification of society (concept no. 5); • changes in housing costs and changes in land use type (concept no. 7); • reducing the use of land for agricultural needs and changing people's attitudes to more individualistic ones (concept no. 9); • The use of products from degraded lands leads to an increase in cancer incidence in the region (concept no. 6);

which refers to the need for extensive research on eco-habitus, which, obviously, more than characterizes ecological culture.

After analyzing individual statements, private research concepts were drawn up, which consisted of highlighting the expert's position in a one-sentence format regarding the social consequences of land degradation. Such concepts were formulated based on the entire text of each interview. According to experts (the approval number corresponds to the assigned expert number), the consequences of land degradation are expressed:

1. indirectly through economic, environmental, and resource issues arising in local communities;
2. in deterioration of the quality and expectancy of life, in loss of jobs, and in forced migration of the population;
3. in reducing economic and recreational benefits, leading in extreme situations to a decrease in social status and even migration;
4. most often, in changes in yield, with tangible negative social consequences appearing only in extreme cases;
5. in increasing stratification of society, migration, crop shortages, and, as a consequence, economic losses and hunger;
6. to the greatest extent, through population problems (for example, the use of products from degraded lands can lead to an increase in cancer incidence);
7. in a drop in productivity, a change in land use types, a deterioration in the recreational properties of land (and, consequently, the quality of recreation), population migration, and fluctuations in housing costs and life expectancy;

8. in adverse socioeconomic consequences that concern issues of food security, hunger, migration, and changes in social status;

9. in decreasing soil fertility, difficulties in using land for agricultural needs, and growth of more individualistic relationships between people.

To formalize the results of the expert interview, a system was compiled for assigning significance indicates particular concepts in accordance with the presence of an articulated position of a particular expert regarding the social consequences of land degradation in each surveyed block separately. This made it possible to prevent quantitative reduction in data analysis.

Based on individual research concepts and taking into account the obtained scores, a generalized conceptual model of expert knowledge in the field of land degradation problems was compiled (Table 1). The model was based on concepts nos. 8, 3, and 7; concepts nos. 5, 9, and 4 were used as complementary ones; and concepts nos. 2, 1, and 6 were used as supporting ones (Table 1).

DISCUSSION

The conducted research and the results obtained allow us to outline ways to conceptualize the problems of studying the social consequences of land degradation. According to Table 1, the generalized expert model includes three main components.

The *first component* is a general expert opinion, that is, provisions that are more or less generally accepted and expressed in the concepts of most experts. As might be expected, the greatest consensus was achieved in the area of established views. They are the basis of the model, which is complemented by private and individual opinions. It can be seen that the provisions high-

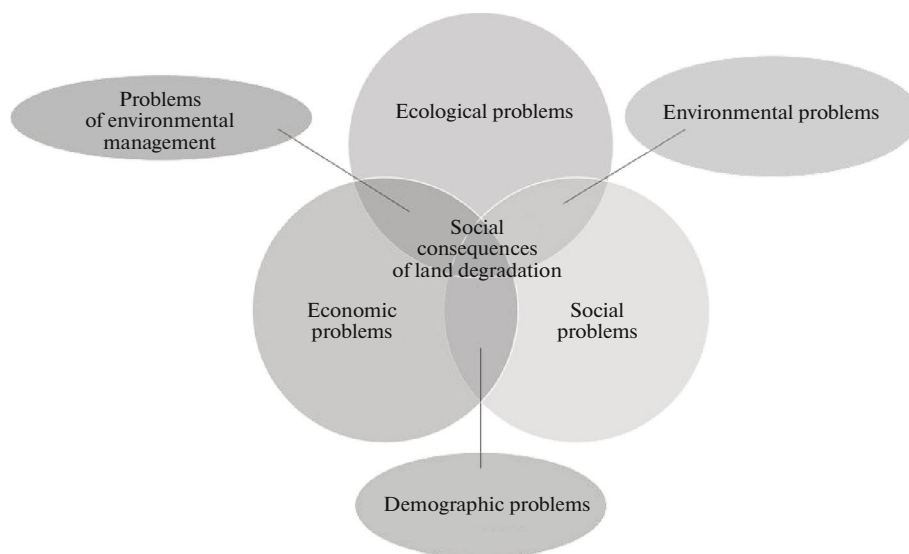


Fig. 2. General diagram of the structure of the formation of social consequences of land degradation from the point of view of the concept of sustainable development.

lighted in the general expert opinion contain three aspects, the first two: the consequences of land degradation have a negative and direct impact on the social consequences of land use. The third position in the general expert opinion concerns the understanding of the multidimensionality of the formation of social consequences, dividing them into three areas, and accordingly refers to the concept of sustainable development.

The *second component* is a private expert opinion, that is, provisions expressed in the concepts of a minority, but not less than two experts, which serves as an auxiliary means for taking into account those aspects of the phenomenon and factors that are not included in the general opinion or regarding which there are differences. Most of the provisions presented in this part of the model are focused on the consequences of land degradation and the specification of these consequences that are relevant to the socio-economic sphere. In addition, there is an opposite position regarding the general expert opinion, where we are talking about the indirect nature of the consequences of land degradation. Note that this cannot be said to be a complete contradiction to the general expert opinion, since the mediated and non-mediated nature of the consequences can be present simultaneously. Also noteworthy is the view that extreme forms of land degradation significantly increase social consequences.

The *third component* deals with individual expert opinions—provisions that are individually expressed in the concepts of experts. The vast majority of such provisions also relate to specifying the consequences of land degradation. These opinions themselves have the same functional significance for the model as pri-

vate expert opinions, with the only difference being that the former reflect some less common details of the social consequences of land degradation in the opinion of experts. In turn, collecting and taking into account such opinions allows us, first, to touch upon some specific aspects that allow us to look at the subject of research from a different angle and, second, to continue, clarify, and expand the main line of the generalized expert model.

In the most general form, the problems of sustainable development in the field of studying the social consequences of land degradation can be presented as follows (Fig. 2).

As can be seen from Fig. 2, the social consequences of land degradation are at the intersection of all these issues; that is, they exist within the framework of the cumulative mutual influence of a number of interdisciplinary areas. Let us note that it is the intersections of an initially interdisciplinary nature, such as problems of environmental management, environmental and demographic problems, which underlie the social consequences of land degradation; i.e., the problem is more interdisciplinary and complex than it might seem. In this case, the social consequences of land degradation can be understood as a decline in the overall level of ecological characteristics of the landscape and the human effort expended on it, expressed in various forms of social action and interaction.

CONCLUSIONS

Thus, the following conclusions can be drawn. Issues of land degradation in the modern era of environmental crises, population growth, and technogenic pressure on the biosphere are becoming increasingly

acute and important. Within the framework of the concept of sustainable development, we can talk about both separate three areas of studying the problem of the social consequences of land degradation, as well as interdisciplinary approaches. Most of the research lies in the area of studying the environmental component of land degradation. There is increasing interest in the area of economic assessment of this phenomenon. At the same time, there are not many specialized studies specifically in the field of social consequences of land degradation.

To fill the gap in identifying the main social consequences in the field of land degradation, an expert semiformalized interview was set up, which made it possible to construct private concepts and, then, a generalized expert model of the issues under consideration. The method has proven to be quite valid and can be used to improve and develop the proposed conceptual model.

In general, the model showed that the social consequences of land degradation are negative, non-mediated, and require more attention from both the interdisciplinary scientific community and land managers. The intersection of environmental, economic and social problems produces demographic, environmental, and environmental problems.

Processing and analysis of expert interviews allowed us to conclude that differences in understanding of the social consequences of land degradation are not significant and have a more or less stable unity of positions. At the same time, the integration of expert knowledge made it possible to identify some aspects that some experts have created, while others do not mention these aspects, which allows us to take a broader look at the problem and draw up a more general list of relevant problems.

Please note that, since all the experts basically had extensive experience working in the agricultural zone of Russia, we can expect that experts from other regions will be able to expand the boundaries of the resulting model. At the same time, the majority of respondents are well aware of global trends in this area and have experience working not only in the specified region, which may give reason to believe that their judgments are more or less applicable to other territories, which, in other matters, requires additional verification.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This work does not contain any studies involving human and animal subjects.

CONFLICT OF INTEREST

The authors of this work declare that they have no conflicts of interest.

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