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LANDSCAPE PLANNING:

TOOLS AND EXPERIENCE IN IMPLEMENTATION

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The present book marks a new evolutionary stage in landscape planning in Russia. Drawing on the results of recent methodological studies by Russian and German experts, the authors suggest a number of ideas regarding the use of landscape planning tools for the enforcement of laws of the Russian Federation, the generation of various levels of landscape plans, and the resolution of problems in application.

The description of the results is derived from the implementation of landscape planning tools, preceded by an outline of the European and Russian background experience gained in the elaboration of procedural modalities. Particular emphasis has been placed on the well-established and legally grounded German experience. For the first time, the book presents examples of planning solutions for the regional and municipal levels, and for the procedure of Environmental Impact Assessments (EIA). As regards conditions in Russia, the authors suggest a formalised algorithm for generating planning documents, based on German expertise and experience, and exemplify by implementation at the regional, municipal and local levels in the Baikal region.

Suggestions are made regarding legal security of integrated (territorial) and landscape planning policies. The sectoral (functional) potential of the tools is illustrated by means of the results in water protection, urban planning and integrated planning, as well as those which have used landscape planning techniques to set up specially protected natural areas, and to draft EIA documents.

The book is intended for a wide range of readers: geographers, ecologists and environmentalists, designers, undergraduate and post-graduate students, and for those working in administrative and nature conservancy bodies.

Eleven tables, 50 illustrations. Bibliography: 63 titles.

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FOREWORD

by the German side

In 1992 the Federal Republic of Germany and of the Russian Federation entered into an intergovernmental cooperation agreement in the field of environmental conservation. In that context, it was suggested that the German nature conservancy tool Landscape Planning be adapted to the conditions in the Russian Federation (R.F.). This book presents the results of the effort to implement that process. The advisability of introducing such a tool during a phase when Russia and the newly independent states were shifting to new socio-economic models was dictated by a number of factors.

Landscape planning is a sectoral, cross-disciplinary tool combining, via the involvement and conciliation processes, agencies and policy makers at different levels. Landscape planning identifies deficiencies in nature and landscape management and guides the way to further improvements. It can be used to advantage as a reliable tool for deciding between competing policies and, where appropriate, as a regulatory vehicle for restructuring formerly centralised land use patterns in their spatial and management aspects. Hence landscape planning can act as a supportive tool in the creation and development of relevant regional entities, so as to impart to investment decisions the necessary planning security from an environmental perspective. As a communications tool, landscape planning can promote the process of democratisation and, hence, of social, ecological and economic stabilisation, with the involvement of local residents in the planning process being a high priority issue. It is also possible to harmonise, by means of landscape planning, international and Russian nature conservancy policies and programmes, including the goal of creating the well-concerted Europe and Russia-wide Natura 2000 network. Furthermore, landscape planning aids in pursuing ecologisation of land privatisation processes with due regard for society's long-term interests.

I would like to thank all those involved in this effort – the Russian partners for their commitment, creativity and openness, and the staff members of my agency for their continued drive to attain positive results. Special thanks are due to our long-standing partner, the Institute of Geography of the Siberian Branch of the Russian Academy of Sciences (SB RAS). It is through the sustained, serious effort mounted by the Institute staff that it became possible to adapt, within a relatively short time period, the German experiences to Russia's conditions, thus providing a powerful planning mechanism for various territories and for addressing a variety of environmental challenges.

Implementation of landscape planning in Russia, the world's largest country in area, opens up a new dimension and fresh opportunities for sustainable development of its regions, and for nature conservation and management there.

Professor Dr. Hartmut Vogtmann
President, German Federal Agency for Nature Conservation

FOREWORD

by the Russian side

As an active member of the European Council, Russia is striving to take full advantage of European standards in various spheres of its activity. One important case in point is provided by the signing of the Kyoto Convention, which is aimed at the strategic conservation of our habitat. Over many years we have been collaborating with our German colleagues in the field of environmental conservation. The relevant Intergovernmental Cooperation Agreement signed in 1992 has become an important framework document in our relations.

As the title indicates, this book is one more important landmark in our cooperation. For over a decade now, Russian and German experts have been implementing their expertise, knowledge and know-how in the creation of landscape planning tools that are new in Russia but have long been commonplace in Europe. Properly implemented, landscape planning will be able to provide an opportunity for the elaboration of ecological zoning policies and practices for the Baikal region. There are also some other possibilities for ecologically oriented planning. It is reasonably safe to assume that the significance of Russia's natural wealth, and its unique, pristine landscapes, will now be subject to a new appraisal and vision. A number of challenges still remain to be addressed, particularly the efficiency of organisation of specially protected areas. It would be appropriate to see them as an important component, not only in the realm of nature conservancy but also for the creation of high investment attractiveness, for example in the tourism sector.

Russia has a good legislative basis for nature conservation. In 2002 the law of the R.F. "On Environmental Protection" was passed. Its articles contain many new conservancy ideas and lines of activity, in keeping with European policies and practices. What is needed is to create a methodological framework to permit such legal guidelines to be translated into actual measures. Here, too, landscape planning will certainly find application.

Finally, Russia has undertaken a large number of international commitments by signing a number of important nature conservancy conventions. There is an obvious need for the harmonisation of Russian and international programmes within the framework of the aforementioned documents. It is my hope that in this context, too, much can be gained by landscape planning.

I would like to take this opportunity to wish the Russian and German experts every success in their challenging, yet nationally important commitment and effort to lay the groundwork for sustainable development, drawing on the wealth of European experience.

A.M. Amirkhanov
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1. INTRODUCTION

This Introduction outlines the authors' general view regarding landscape planning and describes background work done in this field by Russian and German experts. Russia has unique land resources, unexcelled worldwide. There is a need to assess this natural wealth in ecological and other contexts, in order to develop a methodological framework for enforcing a number of laws. Effective tools are to be devised, capable of ascertaining the overall characteristics of lands for decision-making at all levels.

Landscape planning should provide a number of important approaches to land policy: systematisation and comprehensive assessment of information, participatory character and flexibility of decision-making, and transparency of ecological requirements for investors.

Landscape planning is a communicative process that involves all stakeholders in planning, including local communities, and contributes to the democratisation and socio-economic stabilisation of society, and to the sustainable development of its territories. It can and must harmonise international and Russian environmental legislation, programmes and projects, with allowance made for the long-term interests of society.

The implementation of these principles and major methodological concepts does not imply direct duplication of international experience. Russia has specific conditions which must be taken into account when conceiving and implementing landscape planning tools in the country.

The book we have the pleasure of making available to Russian and international readers is a continuation and integration of publications produced in the context of a joint Russian-German project in the field of landscape planning. Between 1994 and 2004, the Institute of Geography SB RAS, with active advisory support from the German Federal Agency for Nature Conservation, and drawing on German experience, was engaged in the elaboration of a methodological apparatus. The results obtained were tested in various areas of nature conservancy in the Prebaikalia area. For the first time in Russia, the framework for ecological zoning of the Baikal region was developed at a scale of 1:1,000,000, covering an area of over 350,000 sq. km. It was the first-ever implementation of the Law of the Russian Federation "On the Protection of Lake Baikal". Landscape Master Plans were generated for a number of municipal districts, such as the Slyudyanka and Irkutsk districts, for the delta locations of the Selenga and Upper Angara rivers, and for the Zabaikalsky National Park; landscape plans were prepared for a number of model areas (Scale: 1:25,000), and large-scale plans were developed for the settlement of Listvyanka and the city of Baikalsk (1:10,000), and for the giant Kovykta gas-condensate field (1:200,000, and 1:50,000).

The legal foundations for this procedure are yet imperfect, a fact which is also highlighted in the book. The authors feel it would be appropriate to make use of the various Russian laws which stipulate the principles of spatial management in various sectors: the Water, Land, Urban Development and Forest Codes of the R.F.. Such an approach improves the effectiveness and responsiveness of landscape planning in the zoning of territories of residential centres as the basis for decision-making in urban development, in the development of strategic development plans for municipal formations, in the setting-up of specially protected natural areas, and in the drawing up of ecological reports when designing enterprises, especially as regards the best choice of sites in an area.

In recent years, at the initiative of the German Federal Agency for Nature Conservation, the background experience has been extended to areas having either a high native-natural value or special significance for demonstrating the effectiveness of the landscape planning tools which have been developed. The latter should include work on the creation of the landscape programme for the Kaliningrad region, which was launched in 2004. The rationale for setting up of biosphere reserves in the countries of the Southern Caucasus and in the Altai region should be regarded as equally promising in the context of implementation of landscape planning tools. The sustainable development potential of these territories is significantly enhanced by singling out protected areas of socio-economic development within the reserves.

The suggested Russian experience relies on German developments in the field of landscape planning and implementation of the relevant tools in sectoral applications. They allow landscape planning to be significantly adapted to ecological education and outreach of the population, as well as permitting a high level of participatory character of reports. Therefore, considerable space in the first chapters is dedicated to these issues.

The present book is hence summarising in character. It includes some previously published material, complemented by fundamentally new information that reflects the experience of using the methodology of landscape planning to tackle various spatial problems of nature management.

The ideas, approaches and methodological recommendations, and also the results from planning efforts that are outlined in the book, lean upon the experience gained by the numerous Russian and German experts. The book sections have been prepared by the following Russian experts: A.N. Antipov (1, 5, 6[1] & 7, and Concluding Remarks), Yu.M. Semenov (5 & 7.2), V.V. Kravchenko (5 & 7.7), V.M. Plyusnin (5.2), A.V. Drozdov (6.2), O.V. Gagarinova (7.3), N.V. Rogovskaya (7.5), E.G. Suvorov (7.6), and by the German experts: W. Milken (2), C. von Haaren (2 & 4), A. Winkelbrandt (3), J. Schiller (3), W. Wende (4), A. Neumann (4), H. Ohlenburg (4) & A. Hoppenstedt (4). Some of the material was also prepared by M.V. Zagorskaya (7.2), V.N. Fedorov (7.3), A.D. Abalakov (7.4) and T.P. Kalikhman (7.4). Section 5.3 was prepared by V.P. Dedkov, G.V. Grishanov, and M.G. Napreyenko.

The idea and layout of the book belong to A.N. Antipov; editing was done by A.N. Antipov together with Yu.M. Semenov; the book was compiled and edited by A.N. Antipov. The comprehensive English version was translated by V.G. Mikhalkovsky.

The book is published with the support of the German Federal Government, and is intended for ecologists, geographers, experts in the field of spatial planning, such as researchers and regional planners, and for regional administrative bodies supervising socio-economic development and nature conservation. It is the authors' hope that they have managed not only to outline the German model, but also to describe in sufficient detail the experience of generating different-scale landscape plans with applicability to the actual conditions of today's Russia, and to various spatial problems, as well as to generate interest among colleagues in the long-term development of ecologically oriented land use planning.

The Russian authors of the book wish to express their sincere appreciation to their German colleagues, who have participated in the project implementation in its various phases as consultants and experts, for their very fruitful cooperation. Special thanks are due to the German Federal Agency for Nature Conservation and, first and foremost, to its Director and Professor Arnd Winkelbrandt and Heinrich Schmauder, without whose many years of commitment this book would never have been published.

1.1. WHAT IS LANDSCAPE PLANNING AND WHAT ARE ITS GOALS?

First, it is a tool for the systemisation and target analysis of information concerning the present status, significance and vulnerability of natural environments and complexes (systemisation). Second, it is a tool for land assessment and evaluation in a broad sense, including the geopolitical position of lands, the strategic prospects for their use, and the adaptation of stipulations to land use in compliance with international standards (comprehensive assessment).

Third, it is a tool that combines, through efficient interaction mechanisms, various agencies and policy-makers at different levels (management). Fourth, it is a tool for the extensive involvement of the public in the planning process via accessibility and the high information content of documents generated (involvement).

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[1] Section 6.1. was prepared on the basis of articles by G. Winter (1999) and E.V. Gritsenko (1999) [Please move this footnote to section 1. Introduction].

Fifth, it is a tool for searching for optimal decisions in the presence of competing options regarding the utilisation of resources and natural complexes, especially in the process of establishing market relationships (weighing).

And, sixth, this tool allows investors to take into account the requirements imposed on projects and make proper, timely decisions regarding the advisability of implementing them. Thus, a high investment attractiveness of the area involved is produced (transparency).

Landscape planning is a communicative process that involves, in the planning process, all interested parties, including local communities, and promotes the democratisation and socio-economic stabilisation of society, and the sustainable development of its territories. It is able to, and should, harmonise international and Russian nature conservancy legislation, programmes and projects with due regard for society's long-term interests.

Implementation of the principles and basic methodological concepts does not imply direct duplication of international experience. Russia has specific conditions which need to be taken into account when establishing the landscape planning tools there:

1. Vast territories are still natural landscapes, which is not true of other developed countries. This is a key factor in the significant difference in practices used to analyze the state and stability of natural systems, and their dynamic and evolutionary patterns in the context of active economic expansion. At the same time, while in European countries concerns of landscape conservation and improvement may prevail over those of socio-economic development, under Russian conditions, the goals of raising the living standard of the population usually retain priority in the managerial decision-making process.

2. A major part of Russia's territory has been poorly studied to date. All this raises the issue of the development and implementation of thematic mapping methods, the elaboration of umbrella approaches, the extrapolation and interpolation of the previously obtained data, and the use of remote-sensing technologies.

3. Russia is, due to financial constraints, unable to produce distinct procedures for purely ecological planning. In any case, it is necessary to make allowance for socio-economic development, and to create integrated plans of well-balanced, mutually reinforcing social-ecological-economic development. It seems realistic that, already in the early planning stages, landscape plans should be integrated into the plans for such development at the various administrative levels.

4. Unfortunately, the low standard of living will inevitably lead to a low ecological culture, and to lack of experts in ecological law. The public has not yet been involved in the planning process, and the public at large does not feel interested in such procedures, because of firmly entrenched negative ideas about the various plans of the socialist past.

"Sustainable development" or, more properly, balanced social-ecological-economic development as a notion and imperative, has gained international recognition. Moreover, nature and environmental conservation are regarded, along with the economy, as equally important goals. For that reason, the search for solutions, supported by scientific concepts and reliable data and with the goal of providing sustainable spatial development, are considered fundamental tasks of policy and management in most countries. The prime objective of landscape planning in Europe is to help resolve the challenges involved. A wealth of multifaceted experience in this area can and must be instrumental in elaborating the patterns of spatial planning at different levels in all countries. This process also has a bearing on Russia, both as a member of the European Council and as an important political and economic partner of European countries. Russia will therefore have to adopt international environmental standards within its spatial planning system as well.

2. LANDSCAPE PLANNING IN THE EUROPEAN CONTEXT

This chapter outlines the basic principles and the legal and methodological foundations related to nature conservation in the European Union, and presents the forms of territorial ecologically oriented planning for a number of European countries.

The concept of sustainable development is today being placed on the regional development agenda by the governments of many countries. One focus of regional development is on combining policies towards equalisation of living standards in advanced and depressed (or backward) regions, with those aimed at minimising the load on natural resources and the landscape. In searching for regionally specific and ecologically meaningful scenarios for development, landscape planning can be of major significance.

Of vital importance today are the institutional integration of conservation activities and the development of comprehensive, integrated approaches in conservation policy. These demands are in many respects addressed by landscape planning. The legal foundation for its Europe-wide development are specified in Paragraphs R through T, Art. 130 of the Law of European Unity where land use planning is identified as a nature conservation tool.

A vital tool in the field of nature conservancy and its separate components are the "legal lines". They focus EU conservation policy on the protection of species, but also on their habitats, on biodiversity conservation, on air quality protection and rehabilitation, on protection of subsurface and surface water, and on the implementation of the environmental impact assessment procedure. Landscape planning can certainly make its contribution to all these elements of regional policy as well, since it suggests the ecological focus of spatial development plans.

Ecologically oriented spatial planning takes a variety of forms in various European countries. These will be briefly reviewed here, and some of the trends discussed. The particular landscape models in various countries are largely determined by the features of their political systems, the environmental challenges they face, and their respective planning traditions.

Historically, planning in **Great Britain** *holds a lower priority of place than in many other European countries. The planning system is organised there in accordance with the "top-down" principle. It focuses, to a greater extent, not on spatial development initiatives, but on the solution of particular cases. The basic principle embodied in the system is the protection of both private property and the basic public interest. Moreover, the public has been increasingly involved in the planning process. The modalities of land use and permits for a particular kind of spatial utilisation are established primarily according to the circumstances of each particular case, and with due regard for the interests of a particular user, rather than on the basis of uniform rules, which is in compliance with British law. In general, the system is highly flexible and, in terms of public interests, is not nearly transparent enough. Nature conservation and landscape planning outside strictly protected territories are not regarded as priority goals, and are merely of secondary importance.*

The Netherlands, *as one of the most densely populated countries, has a long tradition of nature conservancy and landscape development; this is particularly true of protection and development of the seashore areas. Spatial planning is, however, dominated by the ideas of modification and landscape designing, rather than those of nature conservation. Therefore, a highly differentiated planning system has been established there, which is firmly recognised in policy, management, and society (*Faludi & Falk, *1994).*

Landscape planning tasks in the Netherlands are distributed between three planning tools and laws: territorial planning, ecologically oriented planning, and water resource management. There is no general stipulation covering all ecologically relevant aspects. The relationship between landscape planning and spatial planning here is deeper than in Germany. On the other hand, ecologically oriented planning in the Netherlands has a clearly pronounced sectoral, or functional, character. The public, and all those affected by the planning process, are increasingly involved in the drafting of plans, at

a scale unprecedented in the EU. On the whole, planning focuses on seeking consensus based solutions.

Traditionally, the political and planning system in **France** *is strongly centralised, in spite of attempts to decentralise it. There is a clear allocation of duties to the country's administrative levels – regions, departments, and communes – but almost no links between them. However, recently there have been trends towards an enhanced partnership between the central state and the subordinate levels. Some time ago, spatial planning began to acquire some significance, but solutions prevailed which are tied to particular projects and intentions. Furthermore, spatial planning does not play any role in general planning. Sectoral plans at the national and regional levels are still poorly coordinated. Linkage between different plans is realised only at the local level , when land use plans are drawn up (*ZENKER, *1999).*

Spain *is a quasi-federal state, with significant disparities in population density. In recent years, a marked enhancement in awareness for ecological challenges, as well as in legal support for solutions to them, and in ecologically oriented management and planning, has emerged. This process has greatly benefited from the EU agendas, such as the Natura 2000 programme. The landscape planning concept is literally non-existent in the Spanish planning system. Nor does there exist any relevant professional training programme. However, the landscape planning-related objectives are achieved using other tools. In general, the emphasis has shifted from a strictly aesthetic views of the landscape towards an understanding of it as a cultural phenomenon and, ultimately, towards landscape-ecological ideas.*

Yet all these countries, each with its own planning system, which is in turn a response to challenges of the economy, and has developed in the context of the enhanced cultural openness and the establishment of a pan-European dimension in policy, are united by the need to develop common solutions. Therefore, in all of the planning systems considered above, one can identify more-or-less clear tendencies that reflect the need to create tools to enable control over the established order and over the processes of social or economic self-organisation in an effort to achieve sustainable development.

2.1. THE ECOLOGICAL APPROACH IN REGIONAL POLICY

The policies and practices of landscape planning should be considered within the context of ecological aspects of regional policy and regional planning, or should at least be correlated with them. "Regional" is used in reference to the state policy related to management of the economic, social and political development of the country, with a view of the specific character and interests of particular regions. One of the tools of such management is regional planning, typically pursued within the framework of, or in connection with, general spatial planning.

Since the 1970s, regional policy and planning in Europe have acquiring a pronounced ecological focus. On the one hand, it has originated in, and is built upon, the ecological imperative, of which society is becoming increasingly aware, and, on the other, it is affected by the traditions of land use planning.

A powerful spur in shaping the current strategic approaches for the implementation of regional policy is the idea of sustainable development, formulated in general terms in the Agenda 21, the Rio Declaration on the Environment and Development, and the Statement of Principles for the Sustainable Management of Forests, adopted by 178 governments at the UN Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, 3 to 14 June 1992.

The concept of sustainable development has been and is being included by governments of many countries in their regional development plans. In European countries, international cooperation on these issues is directed and coordinated by the European Council and its Directorate for Environment and Local Authorities. Some of the EU member countries have set up ministries and institutes for regional planning. Conferences on

issues related to sustainable spatial development of European regions are held on a regular basis under the aegis of the Council.

The problem of combining the political guidelines for equalising living standards in advanced and depressed (or backward) regions with the requirements for the mitigation of the pressure on the environment and natural resources is becoming a key focus of regional development. Obviously, approaches to resolving this problem cannot have a universal character, but a general avenue for progress in this direction could begin by revising the well-established view of a model of development common to all regions and countries based on classic urbanisation and industrialisation. In searching for regionally specific and ecologically interpreted scenarios of development, landscape planning could play a critical role.

The dimensions of Russia, coupled with its natural, economic and cultural diversity and its federal structure, dictate the need to pursue regional policies of scale. On the other hand, the ecological focus of regional policy as a systemic agenda of the federal centre has not been elaborated to date. In the 1990s, despite efforts undertaken by the State Committee of the Russian Federation for Environmental Protection, the Ministry of the Economy of the R.F., and its Council for the Siting of Productive Forces and Economic Cooperation, as well as of other government and public organisations, no such policy emerged, even in conceptual form. The beginning of the new millennium was marked by still greater problems in the pursuance of an intelligible environmental policy at the federal level. Organisational restructuring and reform of the country's nature conservancy bodies have not yet culminated in awareness-building regarding economic relations. One serious outstanding problem is that of combining the supervisory and authorising functions in federal and regional nature conservancy bodies, which greatly undermines the positive trends triggered in society during the period of political reform.

Nevertheless, the R.F. now has some preconditions for the pursuance and further development of regional eco-policy. Noteworthy in this context is the gradually emerging process of focus on environmental legislation in Russia. In recent years, a number of important laws have been adopted that scrutinise economic projects in terms of their environmental impact; these include the Law "On Natural Environmental Conservation" (2002), the Land Code of the R.F. (2001), and others. The Law "On the Protection of Lake Baikal", its regional context notwithstanding, is of fundamentally important federal and international significance, exemplifying the regional focus of the emergent positive trends and the interests of superior authorities in management of unique natural sites. On the other hand, most legislation is of skeleton character, and not underpinned by systemic procedural methods and tools for enforcement. For this reason, Russia is forced to rely on the experience accumulated in countries that have successfully passed through the "crucible" of environmental restructuring. In this context, one of the most powerful tools for systemic enforcement of legislation is landscape planning.

2.2. LANDSCAPE AND SPATIAL PLANNING

"Sustainable development" has gained international recognition as a concept and as an imperative. Also, nature conservation and environmental protection, along with economics, are regarded as equally important goals. For that reason, in most countries the quest for solutions based on scientific concepts and reliable data and focused on the provision of sustainable spatial development, is viewed as a crucial mission of policy and management. It is a key objective of landscape planning in Europe to assist in addressing and resolving relevant challenges. Landscape planning, with a wealth of multifaceted experience, can and must be included in the promotion and development of spatial planning systems at various level worldwide.

In the European Union and the Council of Europe, cooperation of their member countries in the field of nature conservation and environmental protection as well as in territorial (spatial) planning is gradually, yet steadily, acquiring an increasingly greater significance for the following reasons:

· EU policy is exerting an increasing influence on the ecological aspects of spatial development;

· European standards for the environment and the ecology must rely on uniform guidelines in order to preclude "ecological dumping", and in order to provide long-term guarantees for economic investment;

· Nature conservation and environmental protection become increasingly efficient as they are implemented Europe-wide, thus acquire a cross-boundary character; and

· Landscape planning guidelines, through their Europe-wide implementation, are acquiring a political dimension.

National planning systems must be developed with due regard for the factors cited above. In Spain and Portugal for example, almost all environmental law is based on European standards, whereas in Denmark, only about half of legislation is dictated by European legal guidelines (the so-called "Legal Lines"). These are to be enforced on countries which newly accede to the European Union. The relevant stipulations are currently in preparation.

This process is also relevant to Russia. As a member country of the Council of Europe and an important political and economic partner of European countries, Russia must adhere to international environmental standards and planning systems.

Below is an overview of the landscape planning features at the European level, and in several countries. Of course, both framework characteristics and individual trends and positive results of landscape planning can be useful for the adaptation of such planning efforts to Russia.

2.3. ENVIRONMENTAL AND NATURE CONSERVATION IN THE EUROPEAN UNION

The efforts in the field of nature conservation and environmental protection at the European level should be seen within the context of the gradual shaping of the European Community and, now, the European Union (EU). The path to this political union has been paved with a multitude of environmental treaties and laws. Step by step, there has emerged a general awareness of the countries' responsibility for the environment, manifested in a large number of initiatives.

The commitment of the European Community to environmental protection emerged as early as 1971, and was embodied in the first environmental programme in 1972. In 1981, the Directorate General for the Environment XI was set up in the European Commission, with its seat in Brussels. Under Article 130 of the Law on European Unity, environmental protection received the status of a separate, independent mission of the Community. The Maastricht Treaty (1993) strengthened the legal foundations for this Europe-wide commitment. Action programmes for environmental protection became the duty of European bodies. Finally, the Amsterdam Treaty (1997) defined sustainable development as binding upon all EU countries in their environmental conservancy agendas (Kraemer, 1998).

As in other realms of cooperation, nature conservation and environment protection in the EU is pursued through observance of the balance between the required centralisation of the EU's powers and the political flexibility and freedom of the member countries. Under the European Unity Law, the EU takes more effective actions if the goals of nature conservations are coordinated at a European rather than at the national level. The need to use such a decision-making process should be considered in each particular case.

The EU does not stipulate the right to a healthy environment as a basic right, but nature conservation and environmental protection have a clearly defined primary and secondary basis (Schrlider, 1998). In general, environmental law in Europe falls short of providing internal harmonisation. This involves some inconsistency, as, on the one hand, it is characterised by excess "regulation", and, on the other, by poorly elaborated inter-

nal mechanisms by which to achieve objectives. Thus, European law often sets forth progressive standards, but some countries lack the legal vehicles for their enforcement.

At this point, it is appropriate to remember that environmental problems have their origins primarily in the fragmentation of the open landscape due to sub-urbanisation processes amplified by the urbanisation of rural areas, the wide-scale eutrophication and acidification of ecosystems, and poor management of water resources.

Below is an outline of the most important initiatives of the EU in the field of environmental protection which are of major significance for landscape planning.

A key tool for the protection of species and biotopes is provided by "legal lines" for the protection of flora and fauna habitats, as well as the "legal line" for the protection of birds. These focus the EU's nature conservation policies not only on the protection of species, but also on habitats. They make a substantial contribution to biodiversity conservation, since they stipulate the protection of natural and quasi-natural assets.

The member countries are to submit to the EU information about the habitats of protected species as well as about valuable biotopes. The European Commission appraises the information and integrates it according to bio-geographical regions that are to be combined into the Natura 2000 network, which aims at the creation of a representative system of protected areas in Europe. The EU member countries are to support and develop their parts of this system. Possible negative impacts , including plans and projects with relevant impacts on the network, are to be subjected to ecological review, and either rejected or compensated. In future, reports on the state of the network will also be a "must". Funds appropriated by the EU for nature conservation (LIFE NATURE) must be used to support the Natura 2000 network.

Overall, the enforcement of the "legal lines" in EU member countries has been proceeding at a non-uniform pace and quality. Nevertheless, it constitutes an important nature conservation instrument. It exerts an effect on nature conservation policy, and contributes to the creation of a new standard.

In 1999, legal lines were issued for permissible levels of sulphur dioxide, nitrogen oxides, dust, and airborne lead. These lines set not only the standards but also the methods of measurement, as well as the goals of air quality protection and rehabilitation. For certain circumstances, funds must be appropriated for the implementation of action plans. Appropriate measures are to be taken whenever such standards are violated. These lines are of crucial importance from the perspective of the further development of landscape planning, as they give impetus to the development – within their framework – of relevant requirements for air protection measures as well as for their inclusion in the context of general spatial planning.

Water protection has long been a central element of EU policy. Until recently however, it has been pursued in a patchy fashion, as it was largely tied to admissible emission standards. In 1997, the European Commission drafted relevant lines aimed at an integrated approach in this area.

As a result, surface and subsurface water and the coastal sea waters within one nautical mile of the coast will be treated as a single entity. Guidelines and EU Directives for their quality improvement have been drafted. Aquatic ecosystems and ecosystems affected by the water surface must be protected and utilised in compliance with the principles of sustainable development. In future, they are to be assessed according to their watershed basins, irrespective of the national borders. It is proposed that an integrated approach based on emission standards and quality standards, as well as monitoring operations, technologies and measures focused on the attainment of the required water quality, be used. Once the definite goals and quality criteria, and the stages and time frames for their achievement, are established, it is planned that by 2030, "zero" emissions of hazardous substances will be achieved. The principle to be established is that water have not only an immediate market value; rather, its price should encourage thrifty use.

In the context of the new lines drafted, landscape planning must provide basic information regarding water resources, and elaborate ecologically sound utilisation goals, and also become a partner in water economy in order to achieve the goals formulated. Here, the primary focus is on river valleys and sea coasts.

In 1985, the European Union enacted mandatory procedures for ecological revision and environmental impact assessment (EIA). With some delay, they were incorporated in national legislation and updated, in 1997. These procedures foresee a "thorough impact assessment" – i.e., one encompassing all components of the natural and cultural environment – for projects included in special lists, so as to provide the public, as well as the organisations and individuals that conceive such projects, with information enabling them to prevent or avoid possible negative environmental impacts. These impacts are to be reduced or compensated with due regard for environmental requirements. Overall, despite all difficulties of implementation, these procedures have been instrumental in enhancing the role of ecological stipulations.

Given the strategic significance of the EIA procedures and results, it is advisable to apply them not only to individual sectoral projects. Therefore, in 1996, the EU suggested more integral, comprehensive legal lines to ensure Strategic Environmental Assessment (SEA); these were revised in 1999. They require that land use plans and all sectoral plans having a spatially expressed aspect (waste removal, power generation, etc.) be subjected to the above procedures. In addition, it is recommended that alternatives to such plans with minimal or zero environmental impact also be considered, and that long-term consequences and cumulative effects for various plans be ascertained.

Today, the SEA lines are only of political significance, since the specific mechanisms for their enforcement have not yet been defined. Nevertheless, they serve to expand the range of action in the area of ecologically oriented spatial planning.

It is obvious that SEA is to some extent correlated with the goals of landscape planning in its "German context". Currently, landscape planning is assuming to cover a number of objectives related to environmental assessment in the aftermath of sectoral planning efforts (water, agricultural, etc.), by providing integrated basic information and setting relevant criteria and goals for such assessments. Thus, landscape planning can achieve a number of SEA-specific objectives in the realm of strategic ecologically oriented planning (VON HAAREN *et al.*, 2000).

EU regional policies, thanks to the structural funds and municipal initiatives operating in this sphere, have a great influence on the development of spatial planning in EU member countries. Three different structural funds coordinate the allocation of funds to three types of regions. To obtain such funds, member countries submit their respective plans for regional development to the European Commission; these are then rigorously appraised for their conformity with environmental protection requirements. In order for the municipal initiatives to be supported by the Commission, it is vital that they adhere to definite application standards, which provide for modification of policies to bring them into line with EU environmental requirements.

However, the possibilities for influencing the regions' spatial policies remain limited, and take effect largely in particular sectors of the economy, rather than in the realm of integral development. The requirement for unanimous decision-making in the Council of Ministers of Europe is essentially a barrier to this sector of policy-making. Nevertheless, initiatives for integral regional development have for some time existed in EU regions, and in 1999 they were combined into the European Spatial Development Perspective. This concept, not binding in nature, constitutes a general document of EU member countries, containing a general view of the principles underlying the future political development of European regions, and taking into consideration their natural and cultural heritage, as well as providing equal access to infrastructure, information and knowledge bases. One section of this document gives an outline of the scenarios for regional development, which are currently being refined and updated. Action programmes are also to be developed.

The concept envisages using the existing communications network to disseminate ideas concerning a common development strategy. It would contribute to harmonising the mode of thinking and action plans at different levels, stimulate the development of national systems of regional planning, and strengthen them.

Unquestionably landscape planning can also make its contribution to this sphere of regional politics by presenting the ecological aspect of spatial development plans.

2.4. LANDSCAPE PLANNING IN EUROPEAN COUNTRIES (Other Than Germany)

General Remarks

Ecologically oriented spatial planning is carried out in a great variety of forms in the various European countries. This section presents a very brief overview of these forms, as well as a discussion of some trends towards shaping landscape planning patterns in accordance with general characteristics.

The particular models of landscape planning in different countries are largely determined by the characteristics of political systems, by environmental problems facing the countries in question, and by planning traditions.

Landscape planning in different countries can be incorporated in various fields of activity, and pursued with regard to urban and rural characteristics. In some countries, the concept of landscape, which underlies landscape planning, has a different content than in Germany and Russia. Nevertheless, landscape planning essentially addresses common goals, and contributes to injecting conservationist content and aesthetics into the sectoral planning and general spatial planning processes.

Great Britain

General Aspects

Historically, planning in Great Britain occupies a lower priority of place than in many other European countries. The planning system is organised according to the "top-down" principle, and focuses largely not on spatial development but on solutions to particular cases. The underlying principle of the system is to protect private property and fundamental social interests. Moreover, the public has been increasingly involved in the planning process in recent years. Land use regulations and permits for particular types of land use are primarily determined according to the circumstances of each particular case, with due regard for the interests of a particular user, rather than on the basis of uniform rules; this is inherent in British law. The system as a whole is highly flexible and, from the perspective of social interests, far from transparent at all times. Nature conservation and landscape planning, beyond the confines of strictly protected areas, are not regarded as priority goals and play a secondary role.

Nevertheless, there has been a recent trend towards fuller and more systematic accounting for ecological requirements in planning. In particular, this has taken place in agricultural policy, where EU Directives and guidelines are determinant; this is especially true for entities which receive funds from the EU to carry out environmental measures.

The relatively weak organisation of governmental ecologically oriented planning is partly compensated by the strong positions of British nature conservation and cultural landscape associations. They have a strong influence on public opinion, and thus contribute to strengthening awareness for the significance of ecological nature management in various strata of society.

The Planning System and Levels

The British Ministry of the Environment, Transport and the Regions is in charge of basic strategies serving as guidelines for subordinate levels. Special-purpose programme

developments and measures are carried out by "semi-governmental" organisations, such as the National Trust. Furthermore, the national level performs the basic functions of supervising funding and legal disputes. In spite of attempts to decentralise management and introduce regional bureaus, the regional level has not yet played any substantial role in spatial planning. At a local level, the objectives are distributed among the districts which develop strategic plans, and municipal entities which draw up special-purpose land use plans. There is no such division of functions in urbanised areas.

Land use plans accommodate quite well the interests of agriculture and of the development of settlements. They typically neglect nature conservation goals. Nature conservation planning is limited to setting aside protected areas, which, notwithstanding some successes, leads to their "insulation". In agriculture and forestry, ecological needs are only poorly considered.

Overall, the Ministry of the Environment, Transport and the Regions is now being confronted with too broad a spectrum of problems, while semi-governmental organisations such as English Nature, the Commission for Rural Communities and others are responsible at different levels for narrow sectors of nature and landscape conservation, and develop no plans for mandatory implementation. Therefore, the implementation of nature conservation goals must be assumed by various agencies and boards. Unfortunately, this very flexible system is poorly coordinated. As a result, a large number of individual programmes are mutually incompatible.

Most British people view the landscape as a visual-aesthetic category. For that reason, landscape planning often boils down to designing the view of the landscape. Its place in the planning system is weak; moreover, it is not grounded institutionally. It is mentioned in a number of important policy documents, but rests on no legal foundation. Thus, the scanty legalisation defining governmental control over environmental protection in British law, coupled with the strong positions of private owners, determines the conditions for landscape planning in Great Britain. There is no such thing as an independent or binding landscape plan or programme.

Landscape planning goals are scattered among the various planning sectors. For instance, landscape planning may be required by land use planning for its information base.

Formally therfore, landscape planning in Great Britain is still seeking its "legitimate" place in the system. In practice however, it is active and sometimes achieves good results. Britons are encouraged to pursue its development and the development of ecological law by a number of EU Directives and guidelines (RYDIN, 1994). Overall, society has already become aware of the potential and prospects of landscape planning development in Great Britain.

The Netherlands

General Aspects

The Netherlands, as one of the most densely populated countries, has a long tradition in nature conservancy and landscape development; this is particularly true of protection and development of the sea shore areas. Spatial planning is, however, dominated by the ideas of modification and landscape designing, rather than those of nature conservation. Therefore, a highly differentiated planning system has been established there, which is firmly recognised in policy, management, and society (FALUDI & FALK, 1994).

Landscape planning tasks in the Netherlands are distributed between three planning tools and laws: spatial planning, ecologically oriented planning, and water resources management. There is no general stipulation covering all ecologically relevant aspects. The relationship between landscape planning and spatial planning here is more profound than in Germany. On the other hand, ecologically oriented planning in the Netherlands has a clearly pronounced sectoral, or functional, character. The public, and all those affected by the planning process are increasingly involved in the drafting of plans, at a scale unprecedented in the EU. On the whole, planning focuses on seeking consensus based solutions.

Planning System and Levels

There are three levels of planning. A significant degree of management decentralisation notwithstanding, nature conservation and landscape planning in the Netherlands receive major impetus for development from the state. Responsibility for spatial planning is shared by three ministries. In the matrix underlying the overall planning system (according to sectors and levels of planning), spatial planning at each level has an integrative function, and ensures reconciliation of planning proposals.

The objectives of nature and landscape conservation, as well as of environmental protection in general, are addressed by a number of programmes. A certain analogy to the German landscape programme is provided by the Plan for the Prevention of Damage to Nature, which is focused on nature conservation goals and defines the objectives of the protection of species and biotopes, as well as building the national network of biotopes. The national programme of spatial planning compiles the various plans and describes four basic categories of development plans: the "green course" addresses largely nature conservation, the "yellow course" has to do with intensive agriculture, the "blue course" combines the economic and ecological requirements, and the "brown course" integrates agriculture into other development plans.

Thus, the ministries responsible for planning at the national level define the priority areas and objectives of planning, which are then further elaborated at lower levels. There is no national nature conservation law in the Netherlands. This explains the absence of such legalised categories as national parks, and why landscape planning does not constitute an instrument as such. At the same time, national parks do emerge on the basis of particular political decisions, and nature conservation, albeit very narrowly understood as the protection of species and biotopes in specially protected areas, is highly effective.

The Nature Conservation Plan and the Regional Plan are drawn up at the regional level, and are implemented by the responsible institutions. The country is currently tending towards decentralisation. Therefore, in future, the regional level may well be assigned important coordination functions. Overall, compared to Germany, there is a larger number of specific projects at both the national and the regional levels.

At the local level there is a clear legal division between those planning goals involving areas occupied by human settlements, and those beyond the settlement area. However, landscape plans can be drafted for either kind of area.

Overall, the planning system in the Netherlands includes all major goals of landscape planning, although it is defined much more narrowly as an independent instrument than in Germany. Many issues of landscape planning are incorporated in spatial planning. Therefore, landscape planning formally does not exist at the national or regional levels. However, ecologically oriented planning is gaining acceptance in the Netherlands.

A further aspect of nature conservation policy in the Netherlands is the systematic control of efficiency. Nature conservation instruments are evaluated every four years. Sometimes the results derived from such supervision show drawbacks and deficiencies caused by the division of the nature conservation targets between three different levels of instruments and laws.

In conclusion, it should be noted that in the Netherlands, a high degree of integration of the ecological requirements into sectoral planning has been attained. One further strong side of the planning system is its focus on partnership and on settling conflicts through consensus at all levels. Thus, nature conservation associations play a significant role at the national level as well. And, in spite of a strong economic pressure on the territory of this small country, its society has a "green heart" and cares about landscape development.

France

General Aspects

Traditionally, the political and planning system in ***France*** is strongly centralised, in spite of attempts to decentralise it. There is a clear allocation of duties to the country's administrative levels – regions, departments, and communes – but almost no links between them. However, recently there have been trends towards an enhanced partnership between the central state and the subordinate levels. Some time ago, spatial planning began to acquire some significance, but solutions prevailed which are tied to particular projects and intentions.

Furthermore, spatial planning does not play any role in general planning. Sectoral plans at the national and regional levels are still poorly coordinated. Linkage between different plans is realised only at the level of communes, when land use plans are drawn up (ZENKER, 1999).

The Planning System and Levels

Ecological policy and spatial development are among the primary duties at the national level. The national government, which formulates the guidelines for spatial development, is responsible for all subordinate levels as well. At the regional level, regional plans for spatial organisation and development programmes are drawn up. At the local level, Guideline Utilisation Plans and Land Use Plans are elaborated. Ecologically oriented planning is dominated by the principle of voluntary compliance. Implementation of regional-level directives is stimulated by financial support from the state.

The implementation of landscape planning objectives in France is assigned to various instruments. The state of the environment is described and appraised by many ecological programmes, and by the monitoring programme. The Ecological Plan is drawn up at the national level, which defines the goals in respect to the particular natural elements. The top priority tasks of landscape protection are formulated through planning of protected areas. Natural parks receive good funding, and implement the guidelines of sustainable regional development, which serves the functions of landscape planning. Besides, the spatial utilisation is regulated by various stipulations, such as "ecological loads". This regulation is in part also implemented via contracts and agreements. The results of such agreements are used in other plans, primarily communal land use plans.

The general state plans and plans of regional bodies are regarded as landscape plans, and are designed to govern landscape development. It should be noted that in France, the landscape is viewed as an aesthetic category, as scenery. Therefore, improvement of the scenic surroundings of people and the design of the view of the landscape have priority in the context of landscape planning tasks. Coverage of all areas by landscape planning is legally stipulated. Landscape planning is designed to provide support for policy decisions as necessary, e.g., when planning a motorway. Since they have a practical focus, these plans are always linked to the particular circumstances of a programme or activity. Therefore, serious differences often emerge between planned and implemented measures. And since landscape planning goals are not strictly defined in France, the ideology of trade-offs prevails in the particular cases.

One merit of the system is its focus on practical use, and on public awareness and recognition. The problems, however, are associated with sectoral fragmentation and, as a result, with poor implementation of integral ecological requirements. There is however a certain tendency towards rapprochement of the French and German systems.

Spain

General Aspects

Spain is a quasi-federal State, with significant disparities in population density. In recent years, a marked enhancement in awareness for ecological challenges, as well as in legal support for solutions to them, and in ecologically oriented management and plan-

ning, has emerged. This process has greatly benefited from the EU agendas, such as the Natura 2000 programme. The landscape planning concept is literally non-existent in the Spanish planning system. Nor does there exist any relevant professional training programme. However, the landscape planning-related objectives are achieved using other tools. In general, the emphasis has shifted from a strictly aesthetic views of the landscape towards an understanding of it as a cultural phenomenon and, ultimately, towards landscape-ecological ideas.

The Planning System and Levels

Spatial planning in Spain is broken down into sectors and levels. Regions have full responsibility for spatial planning in cities. The main tools are the regional and sub-regional plans for spatial organisation. Some agencies concerned with spatial plans, such as those engaged with infrastructure planning, often extend their influence far "downwards" from the national level, and place substantial constraints on the regions' scope of activity. The National Hydrological Plan may serve as an example of how difficult it is to design an integral and, at the same time, ecologically critical plan. The possibilities for reconciling the interests of agencies and of different administrative managerial levels are often limited. Under the National Nature Conservation Framework Law, the national-level task is to elaborate nature conservation guidelines. That objective has not been achieved to date. Furthermore, the region of Andalusia, for example, has elaborated its own ecological plan, defining the strategic goals of development.

The responsibilities of the regions include planning of resource utilisation. These plans have a "thorough" character and are focused on socio-economic goals. The regions draw up resource utilisation plans, which are then concretised. Such plans address spatial zoning via the protection of species and biotopes, as well as via the definition of major requirements in other sectoral plans. Often, the guidelines stipulated by these plans are unclear and difficult to implement. In any case, they contain no mutually reconciled targets of nature and landscape conservation. But the specific agendas for implementation of these plans are developed immediately. Therefore, in Andalusia, so-called "sustainable development plans" were developed for communities within the confines of protected areas. In general however, the terms of reference of planning at the local level have not yet been defined (Dietz & von Rauch, 2000).

Plans of resource utilisation are mandatory, and have priority in regard to spatial and sectoral plans. They are not drawn up for all areas, but rather largely for protected areas, especially for the larger ones. In this case, not only nature conservation but also economic goals, for example, the promotion of rural tourism, are pursued. In this context, they become a vehicle for political management of regional finance. However, these plans are not extended to zones of conflict with, for example, intensive agriculture. Therefore, they cannot be equated to German landscape plans, which constitute a nature conservation instrument. Spanish plans can be characterised as "thoroughly" ecologically oriented spatial plans for regions requiring nature conservation as well as extensive utilisation. They are very well suited for substantiating the appropriation of European Union funds intended for spurring the economy in rural areas.

Discussion

It is hardly possible or advisable to make a direct comparison of the landscape planning systems in various European countries, and to reduce them to a few basic features, as these systems differ fundamentally. This is due to a variety of historic, political, cultural, economic, legal, and property-related reasons. Furthermore, there are significant natural differences between the countries of Europe.

However, all these countries, with their planning systems, are united by the need to make concerted decisions in response to challenges posed by the globalisation of the economy, and in connection with their increased cultural openness and the shaping of the pan-European dimension in politics. Therefore, all planning systems considered above

show more-or-less clear tendencies reflecting a need to create tools to provide a means of managing the established order and processes of social or economic self-organisation for the purposes of sustainable development. Among other things, this requires introducing ecological and aesthetic guidelines to the planning systems.

The following trends in spatial planning can be identified:

- comprehensive, "thorough" planning systems are gaining acceptance;
- the planning systems are responsive to the ever increasing impact of market factors;
- the planning procedures are becoming more flexible;
- in some countries (Spain, Belgium), decentralisation of the planning process is taking place;
- there is an increase in general awareness for the significance of urbanised areas for sustainable development; and
- the role played by the state as the highest instance in decision-making is still of fundamental significance.

Landscape planning tasks in different countries are implemented in quite different ways. Ecological requirements on spatial planning exist in the form of holistic integral concepts, but by no means do they exist in all countries, nor at all administrative levels. Different significance is assigned to the goals and stages of landscape planning in different countries. Overall, landscape planning in European countries is certain to become an extensive field of activity.

The success of landscape planning is essentially determined by economic factors. The implementation of the guidelines of any plan depends on the availability of financial resources. The practice of the EU suggests that very significant funds are allocated to sectoral plans to support nature conservation measures, such as in agriculture. However, this situation cannot be seen as satisfactory, as these funds are often used ineffectively, and are sometimes directed toward goals remote from nature conservation. The funds appropriated could be better used if concepts and proposals of landscape planning were taken into consideration at the time of their appropriation.

The landscape planning process does not end with the completion of planned projects. Within the EU, there is an increasingly stronger tendency towards pre- and post-project evaluation of the results of a planning process. Thus, the legal lines regarding flora and fauna protection provide for mandatory reporting for project results. The Dutch and French systems serve as good models of how landscape planning depends on the results of its evaluation. In France, the numerous programmes of financial support provide a sound basis for planning, and induce planners to promote efficiency and transfer their results to the market.

3. THE CONCEPT OF AND THE GERMAN EXPERIENCE IN LANDSCAPE PLANNING AS A MODEL

This chapter describes the concept of landscape planning and related background experience in Germany as a model, and outlines its content, problems and methods, including its contribution to nature conservation and environmental protection, and its usefulness for various users. It also identifies the promulgators and addressees of the landscape planning process, as well as the commitments, participation, cooperation and support required in the drawing up of landscape plans, and the implementation of relevant activities. Finally, it addresses the legal foundations of landscape planning and the issue of the quality, success, and updating of landscape plans.

In Germany, planning and decision-making are carried out at various levels. Since in most cases, the reduction in environmental resilience against detrimental impacts is determined not by the separate anthropogenic loads, but rather by their totality, predictive and coordinating planning is required when a large number of impacts and projects by public planners and private investors are to be expected. The objectives of general spatial planning, i.e. planning at the state and regional levels, as well as construction planning at the local level, involves mutual coordination and compliance with ecological requirements for all private projects with a spatial dimension by builders and other organisations and individuals. Landscape planning furnishes the necessary information about the consequences of impacts for such coordination, and encourages actors who propose projects with a nature management dimension to check those projects for compliance with the requirements of the long-term conservation of the human environment and habitat. Thus, it substantially contributes to the coordination of all forms of nature management and to modification of their impacts according to the criteria of sustainable development.

Landscape planning furnishes other sectoral planning efforts a basis for assessing and developing their own environmental activities, and for implementing special-purpose nature conservancy tools, such as ecological expertises, in order to assess and regulate environmental impacts. It provides them with advance preliminary assessments of expected conflicts in compliance with environmental requirements, and thus allows potential users and sectoral planners to save resources and time. In other words, not only does landscape planning promote the coordination of actors, it also mitigates and precludes conflicts in the realm of nature management by laying the groundwork for sustainable development.

Landscape planning focuses on the identification and assessment of the functions and properties of the landscape, and on the elaboration of proposals related to sustainable conservation of soil, water, air and climate, plants and animals, and the appearance and aesthetic properties of the landscape, in order to create the prerequisites for the healthy interactive functioning of these components. It determines the particular objectives, requirements and measures to be taken, which are then implemented by the joint efforts of planners, nature management stakeholders and proprietors.

The contribution of landscape planning to nature conservation and environmental protection involves gathering and summarising information about the environment and the landscape, coordinating sectoral spatial planning and decision-making, settling conflicts, and also improvement of the effectiveness of planning, enhancement of ecological awareness of the public and authorities, and creation of the planning basis for nature conservancy and recreation.

Under the German Federal Law on Nature Conservation, landscape planning is carried out at several levels: The stipulations and measures related to nature conservation and landscape maintenance at the state level are incorporated into the landscape programme; then, landscape master plans are drawn up for the regions of a state; landscape plans are developed for the local level, and finally so-called "green space plans" are used to detail and deepen the latter.

Landscape planning includes work stages determined by the planning object and the goals: the description of the object, its assessment, and the elaboration of objectives, action programmes and measures for their implementation. It is associated with the social function of planning: public outreach and involvement in the planning process by

all those concerned, including sectoral planning experts, representatives of various institutions, and individual consultants.

The development objectives and measures formulated by landscape planning are addressed to all individuals, associations and authorities engaged, either privately or professionally, in activity linked with environmental or landscape impacts. Institutions whose duties involve the implementation of the guidelines of landscape plans include regional and construction planning boards, nature conservation authorities, and other specialised administrations and sectoral planning institutions. They are mandated to legally assess, support and implement these guidelines as regards their effect on nature conservation and landscape maintenance. Moreover, they are to coordinate these requirements, and incorporate them into the general development stipulations at various levels. In most states, the guidelines for local landscape plans are integrated into local zoning construction plans, and thus becoming binding. Nature conservation institutions are thus both the bearers and the addressees of landscape planning. Under both federal and state law, other specialised sectoral planning administrations are to promote the implementation of the goals of nature conservation and landscape maintenance. For some types of sectoral planning, such as transportation, industrial, energy or military projects, the improvement and development stipulations for nature and landscape conservation are effectively restrictions, while for the others, such as those in forestry and agriculture, they correspond to the goals of those sectors, and can more easily be integrated into the relevant plans.

A vital prerequisite for approval of the landscape plans and their implementation is provided by work with the public: citizens must be able to express their opinions towards projects and communicate their suggestions as well as to obtain the necessary explanation before the policy decision about approval of the plan is taken.

The landscape planning guidelines are implemented both by their promulgators and by the specialised agencies and stakeholders.

3.1. INTRODUCTION

Landscape planning in Germany is a well-established and effective instrument and is applied nationwide. Its roots go back to the early 19th century, when the dominant concepts were the "land improvement" and "land beautification". Another source was the movement for the Protection of Nature and the Homeland that emerged later in the 19th century as a reaction to industrialisation and the destruction of nature. Under the federal law of 1976, landscape planning was for the first time given a legal framework as a planning tool for the protection of the landscape, and for landscape maintenance and development.

Thus, landscape planning was originally established in Germany as a planning discipline. The relevant policies and practices have however been formulated in more recent years, and have made it an important, widely recognised tool of nature conservation.

On the other hand, dramatic social and economic changes have recently sparked a furious debate in Germany as to the best ways to attain ecologically sustainable development. The discussion has been dominated by the question as to which planning tools will be most useful for the implementation of sustainable development as advanced at the UN Summit in Rio de Janeiro in 1992, under the "Agenda for the 21st Century". Below, we will examine in greater detail what landscape planning is, and what its contribution to sustainable development can be.

Forms of planning, coupled with decision-making with significant implications for the natural environment and landscape conditions, have developed in Germany at different levels. Landscape planning makes its contribution to ecologically oriented planning both at the state and regional levels. In the following, we will consider which tasks and decisions from other forms of planning can support and accelerate the landscape planning process. Also, it should be noted that attainment of the new development goals is

feasible only if many people are involved, and this applies to landscape planning as well, which must be pursued with the participation of citizens, both at the elaboration and – especially – at the implementation stage.

In recent years, an increasing number of people have recognized a healthy environment as a critical basis for the quality of life. Soil, water, air and climate, plants, and animals – they are all the bases for human life. In this context, the ultimate goal is to enable nature and the landscape to withstand loads and pressures over the long term. Assuming responsibility for the attainment of these goals is the responsibility not only of nature conservancy agencies, but also of all planners concerned with nature and landscape.

3.2. CONTENT, OBJECTIVES AND METHODS OF LANDSCAPE PLANNING

Content and Objectives

Landscape planning focuses on the identification and assessment of the functions and properties of the landscape, and on elaborating proposals for conservation of the soil, water, air and climate, plants and animals, and the aesthetic qualities of the landscape. Recommendations for ecologically sustainable use of this wealth of nature have been elaborated (LANDSCHAFTSPLANUNG, 1997).

In this process, the following key questions are to be answered:

1. What is present, protection-worthy, and capable of development?
2. What are the existing and anticipated impacts?
3. What will be the result of the realisation of a project?
4. Which long-term models are to define our goals?
5. What must the targets of development and utilisation be?
6. What measures are required?

The specific objectives are thus protection and development of the assets soil, water, air and climate. The task is to preserve, develop or recreate the conditions for the good functioning of these components.

As far as the soil is concerned, this implies primarily the protection of its regulatory and productive functions, and its function as a habitat for plants and animals, by guarding against water and wind erosion and by counteracting overuse and pollution. This refers primarily to soils with high natural fertility, and to rare and particularly sensitive and disturbed soils, such as subsiding and decaying swampy soils.

Moreover, it is necessary to take into consideration the complicated relationship of the exchange processes of water to the characteristics of the soil, and to land use patterns. This means protecting subsurface water formation processes, and preserving groundwater quality and the ability of soils to self-cleanse and regulate surface runoff.

As regards the air and climate, the issues are air quality and noise protection through the creation and maintenance of existing green spaces, as well as ensuring the microclimatic balance by creating and maintaining areas of clean fresh air formation and providing ventilation paths into areas with heat load.

The spectrum of planning tasks in the section "Protection and Development of the Flora and Fauna" involves identification of the inherent biological structure of the landscape, as well as the protection, maintenance and development of the habitats (biotopes) of the flora and fauna by setting up a network of biotopes. The cores of this network must be extensive natural or near-natural biotopes.

However, setting up a network of biotopes is insufficient for the conservation or development of a normal biological structure at the regional level. Rather, this will require an extensive array of habitats which meet the needs of species by reducing the intensity of –primarily agricultural – utilisation in some areas. The detailed goals, requirements, and measures are provided by landscape planning. However, its stipulations are executed by the joint effort of planners, land users, and owners.

Both nature in general and single landscapes in particular play a key role in ensuring a healthy physical and mental environment for people. Therefore, the tasks of the section "Conservation and Development of the Aesthetic Qualities of Nature and the Landscape" include the preservation of a harmonious aspect of the landscape, and maintenance and development of its aesthetic qualities.

This applies not only for pristine, primitive nature, which is hardly to be found in Germany in any case. Rather, attention should focus on the preservation and shaping of a cultural landscape which correspond to conservationist and aesthetic criteria: a diversity of elements, uniqueness, and beauty. These criteria can in turn apply to a variety of landscapes, i.e., both near-natural landscapes only slightly modified by intensive use and not saturated with technical and industrial elements, and also specially created open green spaces in villages and urban centres.

Essential prerequisites for enabling the enjoyment of nature include not only its existence, but also its accessibility to visitors, and the safety of such areas. Therefore, landscape planning includes the tasks of setting aside, preserving and developing land intended for ecologically specific recreation, both for local residents and for visitors, without adversely affecting the natural environment. This means that the creation of a recreational infrastructure that would destroy the landscape is impermissible.

Landscape planning, in this section, as in the other sections, defines:

· Areas with special aesthetic and recreational value;
· Threats to such areas caused by existing and planned uses (including recreational uses);
· Possibilities for reducing or eliminating such threats;
· The goals of development, in both unpopulated and populated areas; and
· Measures for achieving these goals.

Thus landscape planning now faces the following specific tasks:

1) The identification and description, based on studies, of the ability of the natural media to withstand stress; investigation of the linkages and interrelationships between soil, water, air and climate, and flora and fauna, and the diversity, uniqueness and beauty of landscape, i.e. its scenic and aesthetic value; and the recognition of nature and the landscape as an integral dynamic system;

2) The determination of the effects on this system from existing and planned nature management practices, as well as the reactions of the system to human activities; in this case, landscape planning must focus on the preservation of the wealth of nature; also, it must have a "thorough" and all-embracing character;

3) When generating spatial development concepts: Definition of particular quality criteria for nature and the landscape, which should be pursued in order to ensure long-term conservation of the foundations of human life; in this case, measures should be provided to fulfil general nature conservation tasks, as well as to meet the requirements of sectoral plans, and needs of nature management stakeholders;

4) Landscape plans must set forth environmental quality criteria to serve as guidelines for spatial development and for construction and other projects, as well as for measures for the regulation of environmental impacts and ecologically based modification of projects; and

5) Landscape planning must summarise and synthesise environmental requirements, and measures for landscape maintenance, and provide for reconciliation between these requirements and proposals for development project in the respective areas; it must provide the basis for decision-making concerning the permissibility of various projects.

Planning Stages

The working stages in landscape planning include on the one hand those dictated by the object of study itself, and by the planning tasks: the description of the object, its assessment, elaboration of goals and action programmes, and implementation measures;

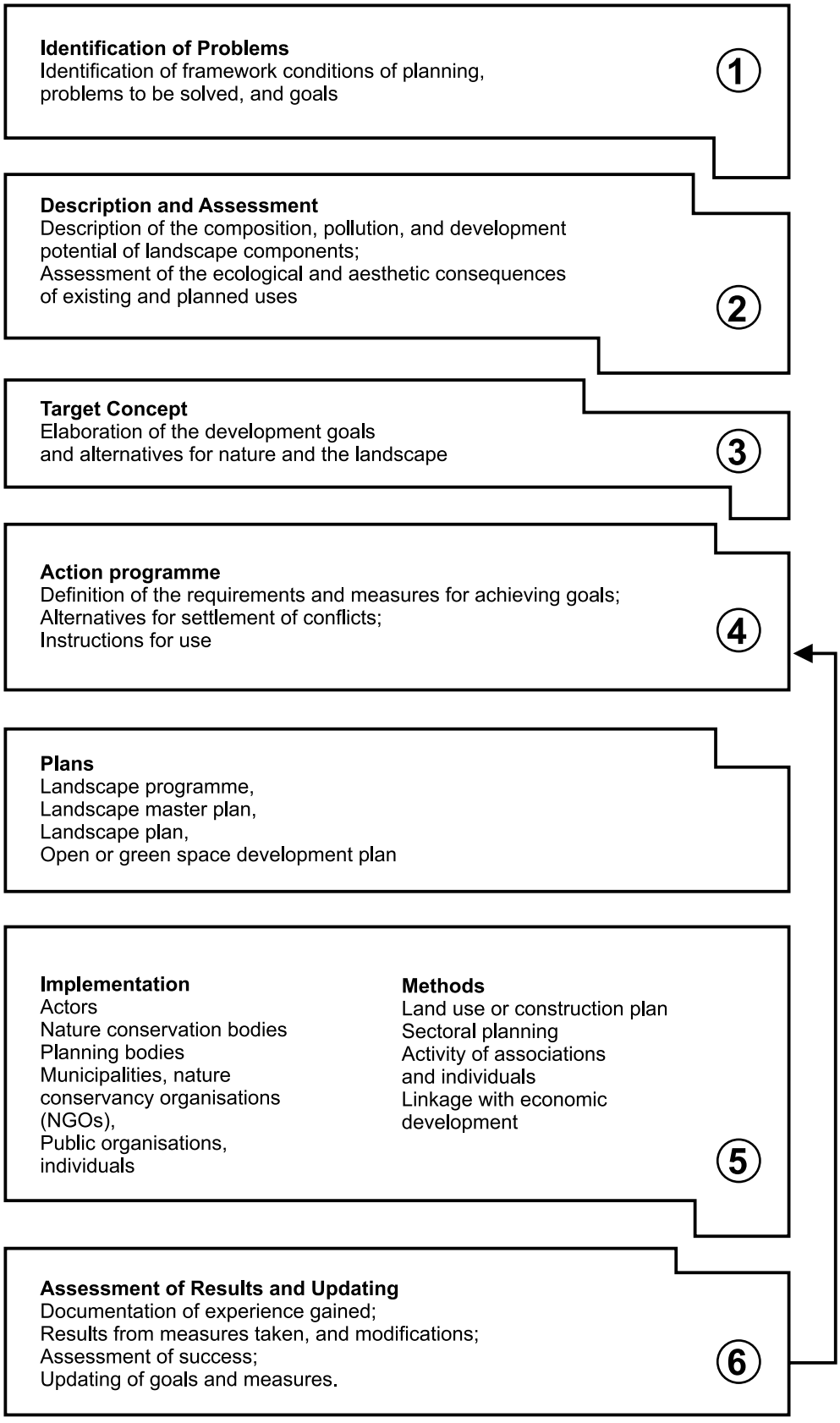


Fig. 1. Stages in Landscape Planning.

on the other, they involve the social function of planning: public outreach and the involvement of all stakeholders in the planning process, including sectoral expert planners, representatives of various institutes, and individual consultants (Fig. 1).

The sequence of stages defined in the elaboration of a plan should be known to all participants of the planning process. In this process, two basic phases are identified: the drafting of the plan, and the implementation of its proposals. In practice, these phases cannot be fully separated, as they often overlap, and as early as the stage of elaboration of the plan, it is often advisable to start implementation of a number of measures recommended by it.

3.3. CONTRIBUTION OF LANDSCAPE PLANNING TO ENVIRONMENTAL AND NATURE CONSERVATION

Summarising Information about Nature and Landscape

Well-founded decisions require knowledge of ecological relationships. On the other hand, overcoming existing adverse impacts and stress on the landscape, and safeguarding against likely new threats, requires knowledge of the present state of nature and the landscape, of threats and trends towards modifications, and of the possibilities of recovering its lost qualities.

Therefore, within the framework of landscape planning, the public, expert planners, and policy-makers obtain a variety of information about the naturally occurring processes and the structure of landscape, and about environmental challenges and opportunities for coping with them. Thus, landscape planning serves to enhance our knowledge of nature and the landscape, and improves our competence in deciding on particular courses of action.

Coordination of Planning and Decision-Making

In most cases, a significant decrease in the resilience of nature against adverse impacts is caused not by individual anthropogenic impacts, but by the combination of these impacts. Therefore, given the great number of projects by both public and private actors, which is characteristic for Germany, a predictive and coordinating planning process is required. The tasks of general spatial planning, i.e. at the state and regional levels, include reconciliation of all private projects with potential spatial impacts, both with one another and with ecological requirements. Landscape planning can provide such reconciliation efforts with the necessary information about the consequences of impacts, and direct all stakeholders toward checking their intentions for compliance with the requirements for long-term conservation of our habitat and our foundations of life. It can make a substantial contribution towards coordinating all forms of nature management and towards mitigating their impacts by providing criteria for ecologically sustainable development.

While water protection planning and similar sectoral tools contribute to overall planning by providing information on individual components of the environment, landscape planning depicts all of them in their interaction. Thus, it is the only type of planning that systemically analyses the priority aspects of environmental protection – from species and biotopes, soils, and climate to recreation problems – and provides relevant assessments in a detailed, spatially definite form.

Settlement of Conflicts, and Improvement of the Efficiency of Planning Efforts

Since landscape planning provides the other kinds of sectoral planning with a framework for assessing and developing their own measures, it can serve as a basis for implementing a number of special-purpose conservation tools, such as ecological revision, and for assessing and regulating environmental impacts. Thus, it provides sectoral planning from the outset with a preliminary estimate of expected conflicts with environmental stipulations, thus permitting potential users and sectoral planners to save money and time. In other words, landscape planning contributes not only to coordinating the actions of nature management stakeholders, but also mitigates or precludes conflicts in the realm of nature management, and lays the groundwork for sustainable development.

Enhancement of the Ecological Awareness of the Public and the Authorities

Through participation in landscape planning, the public and authorities of the regions constantly face challenges posed by nature conservation and environmental protection, and have to find ways to resolve these problems. They thus come closer to an understanding of the ecological linkages, and obtain information about the value of local landscapes. The switch from a negative or prejudiced attitude towards environmental requirements to a positive one is often a by-product of landscape planning. This effect manifests itself in improved mutual understanding among representatives of different agencies and interest groups, as well as in individual initiatives by citizens and associations.

Overall, landscape planning, through its guidelines, contributes to strengthening the linkage between environmental requirements and the economic, social and cultural interests of people, thus encouraging them to pursue the goals of sustainable development in their regions.

The Planning Framework for Nature Conservation and Recreation

Special institutions can use landscape planning proposals and the information base of landscape planning both for the formulation of opinions on various matters and for the development of special-purpose long-term programmes, e.g., for setting up networks of protected areas. Similarly, landscape plans can be used as a framework for proposals for the promotion of naturally and ecologically appropriate forms of recreation.

Types of Plans and Planning Levels

Landscape planning is not an abstract notion. It examines landscape as spaces for human activity. This realm is also addressed by spatial planning (or, more precisely, land use planning), regional planning, and zoning/construction planning, as well as by such sectoral planning procedures as transportation and forest planning. These types of planning are all pursued at different scales, typically corresponding to the levels of administrative areas (Table 1). This principle is also employed in organising landscape planning, which, in accordance with the German Federal Nature Conservation Law, should be carried out at three, or at least two, levels.

General requirements and objectives for nature conservation and landscape maintenance at the state level must be set forth in a landscape programme. Landscape master plans are generated at the regional and/or district level. At the local level, typically, a landscape plan is drawn up. For parts of a township, a so-called open or green space development plan can be produced to detail and concretise the landscape plan.

The landscape master plans must be drafted on the basis of the objectives and requirements of the landscape programme. The same is also true of the derivation of landscape plans from a landscape master plan. Thus, the plans at different levels concretise the goals, requirements and measures for nature conservation and landscape maintenance from the state level to the community level – from general guidelines to measures implemented locally – and are represented in landscape plans or green and open space plans.

Landscape programmes and landscape master plans have been developed for almost all of Germany. Although not all local governments yet have landscape plans, there has been a marked increase in their number in recent years.

3.4. BENEFITS FROM LANDSCAPE PLANNING

Inventory of the Assets of Nature and the Landscape

Landscape planning provides a good overview of the past history and present status of nature and the landscape. Moreover, characteristic elements – old avenues, wet meadows, swamps and other wetlands – that shape the view of a landscape, are unique local elements which are often designated as such only in the landscape planning context. Informing the public – not only the experts – via landscape plans about what is threatened or to be destroyed and in need of protection can lead to new approaches to assessing the values of nature and the landscape.

Table 1. The relationships of landscape planning to general spatial planning and to other types of sectoral planning

Level	General planning	Sectoral planning of environmental protection	Landscape planning	Scale of landscape planning
Federal	Federal spatial management programme	None	None	
State	State spatial development programme*	Sewage cleanup master plan Water supply master plan Special waste disposal plan	Landscape programme	From 1:500,000 to 1:200,000
Region, district	Regional plan*	Water management skeleton plan Water management plan Sewage cleanup plan Special waste disposal plan Air protection and cleanup plan	Landscape master plan	From 1:50,000 to 1:25,000
City or township	Land use plan	Municipal sewage cleanup concept Noise mitigation plan	Landscape plan**	From 1:20,000 to 1:5,000
Community subordinate to township	Binding construction plan		Green or open space plan*	From 1:2 500 to1:1,000

Remarks: ** These plans are not provided in all states; sometime they have different names;*
*** In the city-states, and in North Rhine-Westphalia and Thuringia, special rules apply for these plans.*

The Framework for Decision-Making in Spatial Planning

Landscape planning describes the interests of nature conservation and landscape care that must be considered in the context of spatial planning. Concurrent with such general planning priorities as allotment of areas for development, compensatory measures must also be proposed, and these can be developed only via landscape planning. Landscape planning that is pursued parallel to the general planning process can provide ecological assessment of already planned actions. On the other hand, landscape planning that has been accomplished beforehand can prevent inappropriate actions from being taken in the first place.

Assistance with the Renewal of Cities and Villages

The history of human settlement patterns shows that people are generally attracted towards nature – by undeveloped fluvial plains and terraces, hillsides, etc. Residents of our

cities are striving to "re-introduce" nature to their living space. Landscape planning can be very useful for this process, by supporting it with ecological rationales and systemic approaches.

This same is also true for villages. Their rehabilitation is supported by governmental grants, and is expressed not only in the protection and reconstruction of valuable old structures or plantations, but also in the general ecological rehabilitation of areas via landscape planning.

The Framework for Ecologically Oriented Agriculture, Forestry and Water Management

Contemporary forestry and especially agriculture are severely affected by pollution. This impact is addressed by various programmes of the European Union, and at the national and state levels, in support of extensification, conversion of arable land to non-agricultural use, increase in the share of ecologically managed forest areas, etc. Landscape planning provides a good basis for the implementation of these programmes through detailed, ecologically appropriate proposals, such as for anti-erosion measures, the renovation of forest margins and streams, and the creation of buffer zones in fields and of water-protection zones in watershed areas, etc.

Assistance with Decision-Making at the Municipal and Sub-Township Levels

Landscape planning can support infrastructure development plans that call for a great deal of investment by facilitating the search for ecologically appropriate siting. For the maintenance and support of community properties, measures can be derived from an overall ecological design concept. Biotope care measures, for example, can be carried out on community lands and thus serve as an example for other users. Landscape planning can thus help arrive at environmentally conscious policy decisions.

It is not uncommon for municipalities to be confronted with proposals "from the outside" that greatly affect their interests. Landscape plans, and also framework plans are very useful in these cases. Based on their guidelines, municipal governments can work to change the route of an arterial road, or oppose a construction project.

Systemisation of Private Initiatives and Local Nature Conservancy Actions

A great many people participate in implementing actions that, in one way or another, involve nature conservation problems. Sometimes these actions have a random and unsystematic character. A landscape plan however always includes an integral concept of such measures, and all citizens can and must correlate their actions with it.

3.5. STAKEHOLDERS, ADDRESSEES AND THE MANDATORY NATURE OF LANDSCAPE PLANNING

Stakeholders of Landscape Planning

The responsibility for the creation and implementation of landscape plans varies between the states, and at different administrative levels. If a landscape programme is provided by state law, the responsibility for it usually rests with a superior state level nature conservancy authority (typically the ministry). Drafting landscape master plans is the duty of either the nature conservancy authority or of regional general planning bodies, such as planning boards or district administrations. Drawing up landscape plans is the duty of either the municipality, which also participates in drafting the development plan, or of lower level nature conservancy authorities.

Addressees of Landscape Planning

The development targets and measures formulated by landscape planning are addressed to all individuals, associations and authorities involved, whether on a private basis or professionally, with activities directly associated with impacts on nature and landscape (Fig. 2).

The following public bodies are responsible for the implementation of landscape plan guidelines:

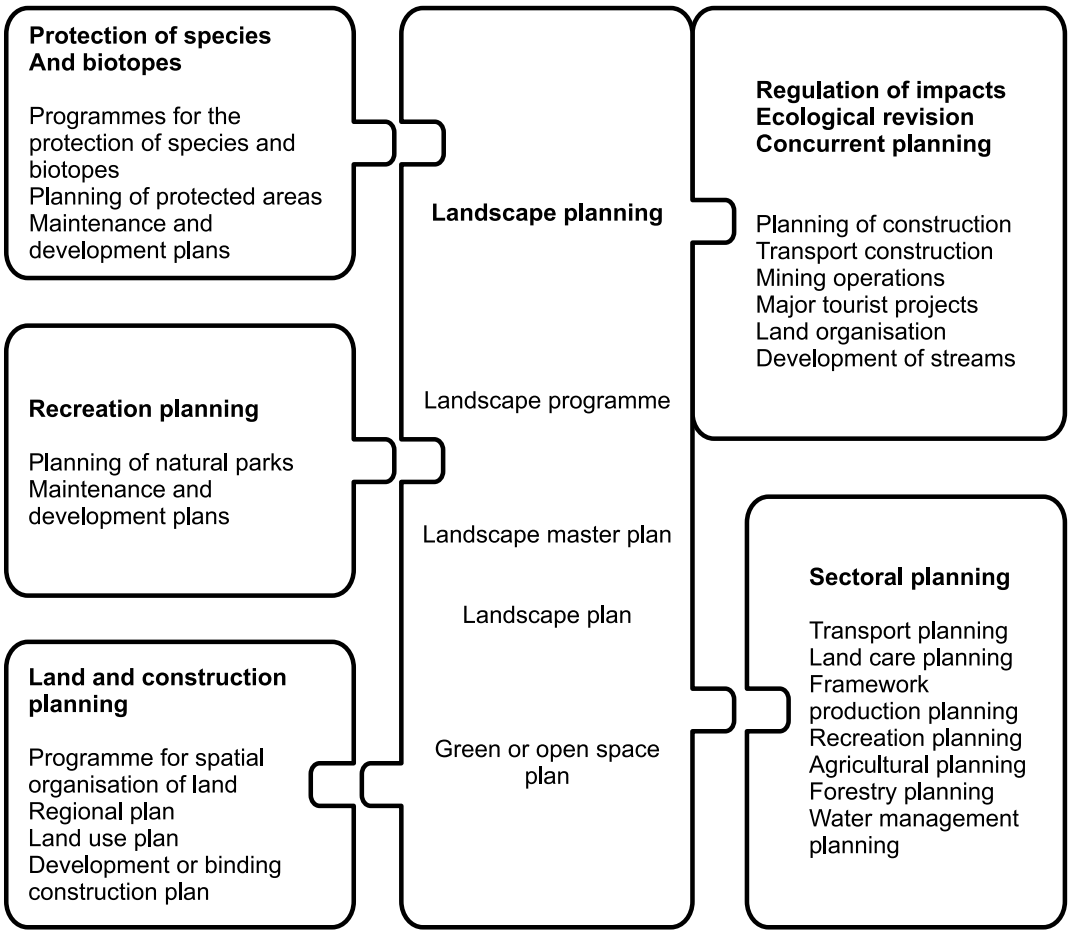


Fig. 2. Relationships of nature conservation and landscape care to planning.

- The promulgators of regional and construction plans,
- Nature conservancy authorities, and
- Other administrative agencies and sectoral planning authorities.

It is legally binding upon these institutions to consider, approve and implement the landscape planning guidelines concerning nature conservation and landscape maintenance. Moreover, regional planning actors must jointly agree to these stipulations and the needs of nature management, and include them in general concepts of spatial development at the various levels.

Major addressees of landscape planning include the promulgators of construction plans. In most states, the guidelines of landscape plans at the local level are integrated into development plans, and are thus binding; in the other states, the master plans themselves are binding. Nature conservancy authorities at any level of landscape planning may be either actors or addressees.

Under both federal and state law, the other special sectoral planning bodies are mandated to assist in implementing the goals of nature conservation and landscape maintenance. For some sectoral planning efforts, such as those for transportation routes, industrial energy plants and military facilities, nature and landscape conservation, improvement and development are effectively constraints. Other types of planning, such as in forestry, agriculture and water management, are required to integrate environmental and conservationist stipulations at an early stage of the planning process.

The Mandatory Character of Landscape Planning

Although landscape planning and the implementation of its directives are mandatory in all sixteen German states, the details of that mandatory character differ. Nevertheless, at the regional level, i.e. at a level of landscape master plans, the guidelines included in the regional plans are binding upon official bodies in almost all states. The lowest-level plans, the landscape and the green or open space plans, are also mandatory

3.6. PARTICIPATION, JOINT EFFORTS AND SUPPORT IN DRAFTING A LANDSCAPE PLAN

Joint Efforts

A number of different "players" can participate in landscape planning:

- Policy makers and responsible local officials;
- Landscape planners from the private sector;
- Representatives of nature conservancy authorities involved in landscape planning, or consultants;
- Representatives of sectoral planning institutions (urban, rural, forestry, water, transport);
- Representatives of trade unions, farmers' unions, chambers of commerce and industry;
- Social groups (environmental associations, local folklore, history and economy groups, sportsmen, anglers, gardeners, and churches); and
- Interested individuals.

Joint work can take a variety of forms, such as sharing information, periodic coordination with various sectoral experts or commissions, or formation of working groups. Landscape planners serve as moderators in such coordination efforts. At initial meetings, arrangements can be made for a division of labour and on the conditions of interaction.

At the different levels of planning, it is useful to set up working groups that will be responsible for the interaction between participants in the process, according to various criteria. Thus, at the state and regional levels, it is advisable to include both planners and representatives of state-level nature conservancy authorities and of other administrative agencies involved with elements of the environment and nature.

Informing, Participation, Assistance and Joint Work

Landscape Planning as a Common Task

The quality of landscape planning and its implementation, and the degree of its acceptance, are largely determined by the extent to which affected and interested persons are involved in the process. Agricultural, forestry and water management agencies can provide important information for planning. Farmland reorganisation offices, soil protection offices and the German Meteorological Service can also provide important data on the soil, water and air. Nature conservancy authorities, if not themselves participating in the planning process, can supply maps and aerial photography of biotopes and protected areas, and also useful advice. Local organisations, citizens, and landowners often have invaluable information, and can present their interests and express their wishes during the planning process.

Public Outreach

Public outreach is a critical precondition for approval and implementation of landscape plans. Regular information on the preparation of plans and the explanation of their contents via the media, public activities and special materials are necessary, especially if the plans do not enjoy wide acceptance from the outset, or are later subject to criticism. In such cases, citizens must be provided with a possibility to express their opinions towards the plans and to make suggestions, as well as to obtain necessary explanations before a political decision on approval of the plan is taken.

It is also important to inform the public about the implementation of already accepted planning proposals, so as to enable a large number of people to get involved in that process.

Drafting the Plan

The foundation for the drafting of a landscape programme, landscape master plan or landscape plan is the collection and assessment of data on the particular natural assets. Field work, such as habitat mapping, and the evaluation of all data on natural assets, such as terrain maps, and finally a review of the ecological and visual impact of existing or planned projects, constitute the basis for the draft plan from which the required measures are to be derived. This draft plan is a stand-alone document, which does not yet include any element of the interests of other users, or of political priorities. The landscape programme, landscape master plan or landscape plan is thus the compilation of all information gathered during this phase. It must be presented prior to the implementation phase of the plan, in the form of a text or as a package of maps. The financial expenditures connected with the implementation of landscape planning are supported by various funding sources, amounting to 40-60% in most states, and even to 80% in a few.

Implementation

The implementation of the guidelines of landscape planning involves the promulgators of the plan, the relevant administrative agencies, and interested persons. It has been shown that the implementation of some measures prior to the completion of the drafting of the plan can substantially raise the motivation for the completion of the process.

The implementation of the nature conservancy and landscape care goals, requirements and measures provided by landscape planning is carried out via legally binding plans, authorisations and regulations issued in accordance with conservation legislation, as follows:

- Integration of landscape planning into the general spatial and construction planning of the states and regions (e.g., the state spatial organisation program, the regional spatial organisation program, the regional development plan, or the land use plan);
- Integration of landscape planning into some other sectoral plan (e.g., the transportation plan, the waterway development plan, or the farmland reorganisation plan), or into authorisation processes for specific projects (e.g. excavation or forestation plans);
- Implementation of landscape recommendations planning in the course of procedures for the enforcement of the nature conservancy legislation of the states, such as measures for the protection of species, or intervention regulations.

Implementation of this integration into the legally binding planning processes will be all the more successful, the better and clearer their justification and the more concrete the proposals for the integration into them of landscape planning formulations are.

Acquisition of Land and Contractual Agreements

The guidelines for landscape planning may involve civil law contracts, such as with owners of farmland or woodland, or nature conservancy organisations, or leases from such land owners as churches or foundations. In most cases, this is done on a voluntary basis, and their consent can be obtained as early as the first stages of planning.

Funding sources exist to support such actions. It is not uncommon for funding to be obtained from the EU, or from the federal or state governments, under various programmes and legal regulations. They are available both for direct nature conservancy measures and for ecological forms of nature management, such as the extensification of agriculture.

3.7. LEGAL FRAMEWORK

Under Paragraphs 1 and 2 of the Federal Nature Conservation Law, the will of society to protect nature and the landscape is defined as ensuring the viability of the balance

of nature and the utility of natural assets in such a way as to permanently protect plants and animals and their habitats, as well as the diversity, uniqueness and beauty of nature and the landscape, including the ability to experience it. Consequently, it is necessary to ensure a long-term capacity for integrated interaction of such natural components as the soil, water, air and climate, and the flora and fauna, with their physical, chemical and biological functions, which in turn ensure the foundations of human life.

Under existing law, nature conservation should be pursued in all areas – of course, in different modalities and with different rigor – ranging from setting aside protected areas to separate nature conservancy measures for lands under intensive use. Since there are as yet hardly any economic incentives for the long-term conservation of natural assets, most of them are threatened by overuse. For this reason, the legal regulation of the relationship between the management and the protection of nature is necessary, including precautionary planning, such as landscape planning, the most important tool for nature conservancy.

The German states have adopted landscape planning as a working tool, and introduced it at various levels of planning, while defining its contents and methods of enforcement differently. Since, except for North Rhine-Westphalia and the city-states, landscape planning is not directly legally binding, its effect can be ensured in two ways:

- Through its inclusion in other types of planning or legally binding regulation; or
- Through the voluntary recognition and implementation of its guidelines.

The actual situation differs greatly among the German states.

When Should Landscape Planning Be Carried Out?

Under federal law, landscape plans are always necessary "as soon as, and to the extent that there arises a need for nature conservation and landscape care" (Article 6, Paragraph 1). Typically, this occurs in the following cases:

- Whenever a construction plan is elaborated, modified or amended;
- Whenever, as a result of a plan or project, impacts on nature and the landscape of spatial significance are to be expected;
- Whenever ecologically specially valuable landscapes or landscape areas are involved; and/or
- Whenever areas of relevance to tourism are involved.

Especially in the case of regional or construction planning, landscape planning should precede the start of the project planning process, so that the results can be taken into consideration beforehand and any necessary measures, e.g. for the avoidance of or compensation for planned impacts, can be integrated into the general landscape planning concept.

How Should Landscape Structure Plans and Landscape Plans Be Drawn Up?

Most states have issued special legal regulations as to how to draw up landscape structure plans and landscape plans. They are available from the respective state ministry responsible for nature conservation. The Inter-State Task Force for Nature Conservation, Landscape Care and Recreation (LANA) has formulated "Minimum Requirements for Local Landscape Planning".

A landscape plan must in principle be all-embracing, i.e., it must cover both inhabited and uninhabited areas, and contain both a text and maps. Measures suggested by landscape plans must have clear priorities over time, be addressed to particular actors, and must indicate methods of implementation. The preparatory phase of a landscape plan must be at least eighteen months long, in order to be able to cover the entire annual cycle in describing the components of landscape, especially its vegetation and its fauna. Maps compiled as part of the landscape planning process must be provided, where possible, with a uniform legend. With this end in view, the German Federal Agency for Nature Conservation, in collaboration with the nature conservancy authorities of the states, has prepared and published the "Conventional Signs for Landscape Plans" (PLANZEICHEN, 2000).

3.8. DEFICITS IN LANDSCAPE PLANNING

Since landscape planning in most states is not directly legally binding, its implementation depends on other planners, policy-makers, and the public. It is therefore necessary to develop landscape planning tools which will permit the channelling of directives into the mainstream of relations regulated by property law or common law.

While the substantive-methodological standards of landscape planning in Germany are relatively high, they will have to be further developed and perfected in accordance with the new legal provisions of the European Union.

In future, special attention should be paid to the elaboration of strategies to improve the acceptance and implementation of landscape planning directives. These should include improving the adoption of nature conservation and landscape planning goals, requirements and measures into the overall planning process, and their consideration in sectoral plans, and also in specific nature conservation and landscape maintenance measures, in accordance with Paragraphs 1 and 2 of the Federal Nature Conservation Law.

3.9. QUALITY, SUCCESS AND UPDATING OF LANDSCAPE PLANNING

Quality Control

Quality control in landscape planning is ensured in a variety of ways. One approach implies developing detailed, concrete directives and special instructions that are published in accordance with nature conservation legislation at the state level. The involvement of nature conservation experts in the planning process, the quality control of planning can be assured in practice. The fee schedule for architects and engineers (HOAI) has a major impact on quality control, as it defines the content of services to be rendered for various landscape planning procedures, and is oriented towards the goals and principles specified under nature conservation law. The specific definition of such tasks and duties of planners is agreed upon between the customer and the planners in accordance with local circumstances; the bodies responsible for nature conservation may serve as consultants on these issues.

Evaluation of Success; Updating

After completion of the planning process, the plans should be checked periodically for efficiency, and that process documented. This provides an opportunity to take into account new developments in nature conservation landscape care, and to improve the image of the region.

If problems already arise in the course of implementation, and if the planned results are not achieved, the reasons should be identified, since this may indicate the need to correct the plan and revise its goals and measures. It also enables an examination of the effectiveness of the planning and implementation processes.

Since all planning depends heavily on a multitude of variable basic conditions and factors, it is necessary to revise and improve the landscape plans at least every ten years.

3.10. PROFESSIONAL PERSONNEL

If nature conservancy bodies do not themselves draw up landscape plans, this is then done by landscape planning bureaus. These planners shown be graduate engineers with a concentration in landscape care, and have at least two years' practical experience in nature conservation planning. Since landscape planning is an inter-disciplinary activity, the bureaus are often advantageously staffed by experts from different disciplines, or have a broad range of qualifications on their staffs, including landscape planners, biologists, geographers, climatologists, agronomists, etc.

3.11. DEVELOPMENT OF LANDSCAPE PLANNING IN EASTERN GERMANY

After the reunification of Germany on 3 October 1990, the Federal Nature Conservation Law became immediately effective in the new eastern states. However, building new managerial bodies and a new legal framework in eastern Germany took between two and three years, and it was not until then that it was possible to introduce landscape planning. The former East German planning approaches did not correspond to those of landscape planning under West German federal law; at best, they provided a kind of maintenance and development planning process for protected areas.

It was therefore decided to first develop separate model landscape planning projects, thus providing a possibility for both legal and scientific-methodological progress. In addition, many special meetings, interviews, seminars, etc., and also training activities were carried out.

Thanks to these efforts, landscape planning quickly became an effective, powerful tool for nature conservation and environmental protection. That was possible due to the creation of a large number of concrete landscape plans according to the model examples. The greatest progress in this regard was made in the area of landscape master plans at the regional level. Those efforts used existing methodological and procedural experiences accumulated in the western states, and new approaches to planning were developed. As of today, the prerequisites for further enhancement of nature conservation activities have been created in almost the entire territory of the eastern states, through the use of landscape planning.

4. LANDSCAPE PLANNING IMPLEMENTATION AS EXEMPLIFIED BY GERMANY

This Chapter presents examples of German landscape planning at three planning levels: state, regional, and local (municipal). It shows how important landscape planning is for environmental impact assessment. An outline is provided of current trends in landscape planning in Germany.

First, the technical content of the Schleswig-Holstein landscape programme is outlined. Drawing on the legally supported guidelines and policies, this programme defines the essential conservation policies and practices of the state of Schleswig-Holstein, including, prominently, the safeguarding and development of the state's natural heritage. Based on the guidelines covering the entire area, relevant goals are defined in more concrete terms. One goal is, e.g., to identify areas suitable for "as-natural-as-possible" development, to permit a coherent protected area or habitat network to be built. Finally, the landscape programme also contains technical conservation directives and recommendations for other area uses, such as housing development, agriculture and forestry, water management and transportation. The Schleswig-Holstein State Landscape Programme is conceived primarily as an independent planning structure, and has been integrated into the State Regional Development Programme. Thus, it has attained binding quality for authorities.

The Landscape Master Plan specifies both the technical conservation goals and the content at the regional level. Typically, the planning steps include: baseline information and assessment, identification of potential conflicts and potential for landscape development, and the development of an action concept. This sequence is illustrated by the example of the Landscape Master Plan for the Havelland district in Brandenburg, west of Berlin. Major conflicts as regards conservation in this region stem from intensive agriculture. The formerly extensive fen mire landscape of the Havelland has been subjected to large scale melioration, with valuable biotope associations eliminated. The objective of the Landscape Master Plan is to counteract this tendency by means of a detailed action concept.

The Landscape Plan refers to the municipal level. It places the content of the two super-ordinated levels in a concrete context. This Chapter presents the Genthin Landscape Plan in Brandenburg, which is regarded as a classic example. First all, the Landscape Plan identifies and assesses the resources of the ecosystem in the municipality. It includes, among other things, an outline of important areas, with their respective species and habitat functions. Based on this concept, a concrete goal concept is developed for the area at the municipal level. Detailed measures and requirements are then realised to implement this concept. For instance, one measure represents a stream renaturalisation project – the natural restoration of the river, with certification of 20 m-wide buffer strips along the waterline. In addition to the conservation measures, detailed policies and practices are also presented for the other areas. Integration of the content of the plan into the municipal Land Use Plan makes these guidelines binding upon the authorities.

New trends in German landscape planning include increased use of digital media. The potential of interactive landscape planning is to contribute to an enhancement and broader acceptance of this instrument.

Landscape planning is assuming important functions in the qualification of environmental impact assessment efforts in Germany. In addition to factual information, landscape planning and its goals also provide specific assessment standards for the evaluation of possible environmental impacts of plans and projects. The fact that landscape planning has assumed these functions, and that it is proving to be effective, has been demonstrated by the results of recent research plans.

4.1. THE LANDSCAPE PROGRAMME OF THE STATE OF SCHLESWIG-HOLSTEIN

Within the German system of landscape planning, the Landscape Programme currently constitutes the highest planning level. It summarises the requirements and measures for achieving the goals of nature conservations and landscape maintenance at the level of a state. Because of the large areas of states, the landscape programme is highly generalised, both cartographically and substantively. Typically, it is represented at a scale of 1:250,000 or 1:200,000. Some states, such as Rhineland-Palatinate, have developed their landscape programmes in close coordination with their spatial development programmes. This process is called "primary integration".

In this book we present, by way of example, the landscape programme of the state of Schleswig-Holstein, which was developed first as an independent plan, and only later integrated into the spatial development programme; this is an example of "secondary integration". The landscape programme constitutes a separate planning effort and becomes binding upon agencies only through integration into the state's spatial development programme.

The Point of Departure of the Planning Process

In 1999, Germany's northernmost state developed its landscape programme with the participation of public stakeholders and respected nature conservancy associations. Actors of the planning process were represented by superior nature conservancy agencies. The programme covers a territory with a surface area of about 1,575,000 km^2. It is one of Germany's "newest" landscape programmes, and encompasses a broad range of issues, including not only the planning framework for considering the various interests, or the ecological aspect of the state spatial development programme, but also – through mandatory comprehensive inclusion and direct action – the entire range of nature conservancy issues (LANGE, 2002).

Guidelines and Priority Areas of Action

Since landscape planning has a multi-purpose and long-term character, guidelines are formulated first, based on legal targets and principles, as well as on international nature conservation agreements, and subordinate areas of actions are then identified on this basis. Threats of damage to particular natural components must also be considered.

These guidelines include:

Conservation and development of the natural heritage:

- Reduction in depletion of natural resources as well as in the possible entry of harmful substances and biogenic elements into the environment;
- Definition of the concept of "sustainability" as a factor influencing the selection of alternative locations of economic projects; and
- Joint organisation, commitment and responsibility for nature conservation and environmental protection policy on the part of society as a whole.

The top priority area of action for the Guideline 1 includes, first, allocation of fifteen percent of the territory of Schleswig-Holstein as priority territory for nature conservation and natural development, and for the creation of a unified system of specially protected natural areas and biotopes. Implementation of Guideline 2, for example, envisages among other things an increase in the number of water protection zones, and of their share of the territory of the state. The priority areas of actions for Guideline 3 include e.g. improved opportunities for "quiet" recreation in nature as a basis for tourism. Among the priority goals of the Guideline 4 are the exploitation and development of possibilities for public participation in decision-making in the planning and construction of projects (MUNF, 1999).

Goal and Development Concepts for the Protected Assets

Since the landscape programme, as a nature conservation sectoral plan, has an integrative function, the package of natural environmental elements includes "Species and biotopes", "Soils and geology", "Surface and subsurface water", and "Climate and ground-level atmosphere". It also includes the element "Landscape", i.e., the paeleontological and cultural-historical development of the landscape, its diversity, uniqueness and beauty, as well as its significance for recreation. Each element is outlined in separate chapter. The cartographic representation includes various maps at a scale of 1:250,000. The presentation of the general status of each natural component, and the identification of its specific conflicts and problems, is followed by the description of the goals and requirements for each of its natural component (MUNF, 1999).

The chapter entitled "Species and biotopes" is especially extensive. It first illustrates the level of threat to the existence of species and habitats, particular groups of animals, and plant communities, as well as current trends. On this basis, goals are formulated for the protection and development at the state and regional levels. These requirements are presented in three sections.

The section "The system of specially protected areas and biotopes" also addresses the state and, regional levels, with the local level supplemented by additional material, and detailed recommendations for implementation. The section "Protection of areas and objects" discusses all national and international categories of protected areas, and the concepts of protection for specific biotopes. The section "Protection of species" focuses on the level of implementation of various programmes for the protection of specific species.

The Spatial Goal Concept for Nature Conservation

The spatial concept of the goals at the state level of planning must bring together the measures and requirements in the area of nature conservation, showing all especially valuable natural areas, the environmental requirements for them, and the relevant measures and ensuing priorities of planning implementation. Such data must be considered for each area to the extent that nature conservancy interests for projects and objects affect the status of an area. Early allowance for these materials in the process of coordination and consideration also strengthens the reliability of planning (MUNF, 1999).

As a target setting, the spatial target concept depicts the degree of naturalness. In this case, the proportion of little modified elements of a landscape, the parameters and sensitivity of environment, and the potentials for ecological development are taken into account. Thus, the concept is a compilation of all textual and cartographic documents of the landscape programme.

Fig. 4 shows a generalised overview of the distribution, area shares and locations of various target territories. The map provides no basis for particular nature conservation goals, requirements or measures in respect to each area. However, it establishes three categories of territory with different set goals, the first two of which are discussed below. The other maps present various aspects of single natural components, and texts on the landscape programme.

Territories Intended Primarily for Near-Natural Development

These territories, together with territories of regional significance, constitute the core of the system of specially protected areas and biotopes. The prime object is conservation and development, especially of little modified ecosystems requiring a special nature conservancy regime. Spatial boundaries are first delineated on the basis of the criteria of species and biotope protection. However, natural development of these areas is often also needed to ensure the conservation of the soil, surface and subsurface water, the climate, and the landscape. These are for the most part special locations, such as soils of high and back bogs, inland water bodies, shore areas, the North Sea Wadden areas, Baltic Sea shallow waters, valleys, dunes or forest habitats. The areas that have been set aside require conservation, and of course development where possible; they are therefore priority nature conservancy areas. They are also of significance for the implementation of compensation measures required under provisions on impact mitigation regulation.

Territories Intended for Primarily Environmentally Appropriate Development

The goal is conservation and development of landscape regions in which – as a result of implementing largely ecological forms of utilisation – the natural environment and the resources have been preserved. The object is that element of nature affected and modified by utilisation.

In the landscape programme, the following spatial functions are identified:

- Areas of special significance for the conservation and recovery of the functions of soils;
- Areas of special significance for the conservation and recovery of the functions of surface and subsurface water;
- Areas of special significance for species and biotopes of the cultural landscape; and
- Areas of special significance for conservation of the landscape, its diversity, uniqueness and beauty, as well as of recreational areas.

Since the natural component "Climate and ground-level atmosphere" still lacks a database, no areas have yet been set aside for it. Generally, it covers extensive areas in which it is necessary to achieve a peaceful co-existence of the interests of utilisation and nature conservation. More specifically, ecological forms of use are to be applied. While existing types of use remain possible, their further development must be focused on the overall purpose of the area. In the event of implementation of projects and facilities, it is necessary to consider the specific conditions of project location, and to reach decisions that prevent or limit harmful impacts on environment as much as possible. (MUNF, 1999).

Nature Conservancy Directives and Recommendations

The final chapter of the landscape programme provides nature conservancy directives and recommendations for various kinds of use, spatial planning, and projects. Addressees include the following sectors: Development of Residential Areas; Agriculture and Forestry; Hunting; Fishing; Water Management/Bank Protective Systems; Transportation; Extraction of Mineral Resources; Tourism/Recreation/Sports; Waste Decontamination and Disposal; Water Derivation Systems/Restricted Areas and Toxic Sites; and Military Areas. Below, as an example, we present the sectors Development of Residential Areas and Agriculture.

Development of Residential Areas

Compared to other states, Schleswig-Holstein has a relatively low share of residential and commercial areas. However, since the need for housing is constantly rising, the increasing demand for land for housing development must be considered. This same is true of non-residential construction. The following directives and recommendations have been formulated for residential areas:

- Urban development planning in communities should not contribute to the fragmentation of the landscape by residential areas. New housing estates should be built, where possible, adjacent to existing residential areas, until such possibilities are exhausted.
- In the process of building housing and the associated infrastructure, large contiguous areas with valuable landscape elements should be preserved.
- When planning urban development between residential centres linked to the surrounding open landscape, intra-urban greenbelts should be created.

Agriculture

Over seventy percent of the area of Schleswig-Holstein is farmland; hence, agriculture inevitably has a substantial influence on preservation efforts for the natural environment. In regard to agriculture, the following guidelines and recommendations have been stated:

- Agricultural agencies, regional water and land management authorities and other rural bodies must assist in achieving nature conservancy goals (Article 3 of the Nature Conservation Law of the state Schleswig-Holstein); existing measures to this effect should be further developed and optimised;

- Environmental contamination and pollution by agricultural activities should be minimised; and

- No new wetland-reclamation in environmentally sensitive and valuable areas is permitted.

It should be noted in conclusion that the Schleswig-Holstein landscape programme is an excellent example of landscape planning at the state level, distinguished, among other things, by its variety tasks and its commitment to an integrated account of nature conservancy issues.

4.2. LANDSCAPE PLAN (HAVELLAND DISTRICT)

Under the German system of landscape planning, the landscape master plan is the middle level of planning. It outlines the requirements and measures for nature conservation and landscape maintenance at the regional level, and serves as a mediator between the Landscape Programme of a state and the detailed specifications of the local landscape plans. Spatially significant nature conservation and landscape maintenance requirements and measures are to be balanced against other spatially significant interests, and then incorporated in the regional plans. Usually, landscape plans are drafted at a scale of 1:50,000 or 1:100,000, except for those in large cities under direct state jurisdiction, which are at a scale of 1:25,000 (Grunberg, 2002). As an example, the landscape master plan for the Havelland district in Brandenburg is shown below. Its first volume contains the development concept; the second covers the analysis and assessment.

The Point of Departure of the Planning Process

The Havelland district is in the west of the state of Brandenburg, bordering Saxony-Anhalt, and extends eastward to the edge of the Berlin area. The total area is some 1700 km^2, and it has approx. 145,000 inhabitants. The major residential areas are two cities with 32,000 and 27,000 residents, respectively. The spatial use of the areas surrounding these towns is largely industrial and commercial; the rest of the area of the district consists mostly of agricultural and forest lands. Farmland occupies approx. 93,000 ha, while woodlands accounted for some 46,000 ha as of 2000. Roads include a motorway and several federal highways. In addition, two railways and two waterways, the Lower Havel and the Havel Canal, pass through the area (GfU, 2002a).

Analysis and Assessment

The differentiated, comprehensive stage of analysis and assessment includes two chapters of the landscape master plan, which address the natural components and relevant landscape-ecological functions, as well as the historical development of the cultural landscape. Below is an overview of the natural characteristics, the groundwater and surface water, and the flora and fauna.

The Morphogenesis and Fragmentation of the Natural Environment

During the last glacial period, the territory of the Havelland was repeatedly reshaped. The present-day topography of the area was largely the result of advancing valley sand drift and melt water. There are only scattered elevated areas with remnants of base and end moraines protruding out of these drift regions. Characteristic for such flat valley sand regions are the dunes and the areas of blown sand, as well as shallow swamps at near-surface groundwater locations. Glacial plateaus exist in a variety of forms, and have a relatively pronounced topography. On the basis of this morphogenesis, eight subdivisions of natural landscape have been identified for the planning territory.

Groundwater and Surface Water

The view of the Havelland is largely formed by groundwater and surface water, especially that of the Havel River. The slight elevation above sea level, the low flow velocity, and the coincidence of the large glacial spillways show that water had a strong influence on landscape. Nearly one third of the surface water in all of the six states of eastern Germany is drained into the Elbe River via this region. This is of particular significance, too, for the composition of animal and plant communities in the region.

The Flora and Fauna

The Havelland has a large number of areas of value for flora and fauna, including areas with valuable habitats for threatened animal and plant species, and numerous areas certified as of inter-regional significance for species protection. This is especially true of the fluvial plains of the Havel River, and for large mixed forest stands.

Conflicts and Potentials of Landscape Development

Despite this great natural potential, there are also a large number of negative impacts on the environment. For instance, the water balance of the entire Havelland landscape is disturbed. The groundwater table has dropped as a result of industrial agriculture and the accompanying intensive reclamation of extensive wetland areas. The landscape of once extensive fen bogs has in many places been transformed into a monotonous agricultural landscape.

In other agricultural areas, large expanses have been devastated by the removal of biotopes and small groves. The disturbed water balance can be seen here, too, in the form of dry kettle-holes (i.e. lakes formed from dead ice) and former marshes. Nonetheless, much of the formerly intensively used farmland throughout the area is now fallow.

Other than a few isolated stands, the forests consist largely of extensive pine woods, the health of which is poor. Changes in the practices of use that have occurred in agriculture, as well as in forestry, have also resulted in the new possibilities for the ecologically oriented modification of landscape.

Of special significance for the planning territory is the city of Berlin, which is located immediately to the east. It has recently generated significant pressure via increased demand for land for commercial and residential use. On the other hand, the requirements imposed within these landscape areas are also becoming more stringent. They include the preservation of areas for recreation, conservation of sufficient green spaces, and little modified areas as habitats for rare and threatened animal and plant species, and for a stable climate (GfU, 2002a).

The Concept for Development and Action

The goals derived from the analysis and evaluation of the existing inventory of assets for the conservation and improvement of particular functions of the natural environment, of the landscape appearance and of the possibilities for natural, quiet recreation provide the basis for the development concept and framework of action of the landscape master plan.

The Development Concept

Based on the formulation of general nature conservancy guidelines for the entire district, development goals have been established for the assets Species and biotopes, Soils, Groundwater and surface water, Climate/air, and Landscape-based recreation. Each consists of the following target types: Preservation and safeguarding goals, Development/improvement goals, and restoration goals. Moreover, in an additional section, so-called guiding concepts for each of the areas of natural environment have been formulated. They delineate the spatial-structural concepts based on a concretisation of the guidelines and goals of development. Fig. 5 shows a portion of the complex map "The Development Concept: Goals of Development", which contains all the development goals for each natural component. The section of the legend shown

describes a selection of cross-hatching patterns and symbols for groundwater and surface water, adapted to the selected portion of the map.

The Action Concept

The guidelines and development goals formulated in turn provide the basis for the definition of requirements and measures needed for the long-term maintenance of viable and hence protection-worthy functions of the natural environment. Moreover, it is recommended that the restricted functions be improved and harmful environmental impacts be prevented. In addition to the requirements and measures for single natural components, the landscape master plan includes the concept of the creation of special protected areas. In addition to the asset-specific requirements and measures, it also includes a protected area concept, containing both the existing protected or protection-worthy areas and assets, and indications regarding a unified system of biotopes, the species protection programme, and to animal species in the district which require special support and protection. A separate chapter addresses the possible contributions and/or demands upon other kinds of use and sectoral planning with regard to the attainment of nature conservancy goals. This includes the following kinds of utilisation: Residential/commercial; Agriculture, Forestry and water management; Transportation, sports and tourism; Quarrying; Waste management; Energy and radio communications; Military use and conversion; Hunting and fishing; and nature conservation/ landscape maintenance.

Finally, the landscape master plan also provides recommendations for integration into general spatial planning, and recommendations for how the planning process can address and implement the formulated goals and the, requirements and measures (GfU, 2002b).

4.3. LANDSCAPE PLAN OF THE CITY OF GENTHIN

In the German system of landscape planning, the landscape plan constitutes the community level of planning. It specifies the contents of such superordinate plans as the landscape master plan or the landscape programme at the community level. Since such plans are typically prepared at a scale of 1:10,000 or 1:5000, very accurate descriptions and representations of particular areas are possible. This planning tool will here be described using the City of Genthin as an example, on the basis of selected maps.

The Point of Departure of the Planning Process

In early 1994, the town of Genthin, Saxony-Anhalt, with approx. 15,000 residents made the decision to draw up a landscape plan for its territory, and contracted a planning bureau, the *Planungsgruppe Oekologie+Umwelt*, to draft it. It was developed, where possible, concurrently with the zoning plan. This approach permitted a cooperative and interactive planning process, and had a favourable impact on the outcome of both plans. The proposals of the landscape plan that were included in the zoning plan became legally effective once the zoning plan was approved in the spring of 1997.

The development of the town is heavily dependent on its location near a number of important transportation routes: two major federal highways, the Hanover-Magdeburg-Berlin railroad, and the Elbe-Havel Canal. These latter two east-west routes cut the town into three parts. The northern part includes both the old village of Altenplatow and both older and new industrial areas. The centre of Genthin is located between the canal and the railway, while the southern area is dominated by housing estates, including both single-family homes and the densely built blocks of flats typical of former East Germany.

Since the reunification of Germany, the township area has been undergoing large-scale changes, especially as a result of the construction of transport routes such as the above-mentioned railroad, and of the by-pass road to the north of the town. These projects, and also the construction of new residential estates in the southern part of Genthin, had been realised prior to the development of the zoning and the landscape plan. Particularly serious future impacts on the environment are expected from the widening of the Elbe-

Havel Canal. Significant landscape modifications are also possible from the planned and in some cases authorised quarrying of gravel and sand.

Genthin is surrounded by a landscape comprising a mosaic of silt-covered fluvial plains gently sloping to the Elbe River, and extending from the south-west towards the north-east, and flat areas of valley sand deposited by the glacial run-off of the Brandenburg stage of the last ice age. This characteristic landscape structure has in a variety of ways affected its current utilisation, and must be taken into consideration in its subsequent development; this is particularly true of the planning of the expansion of residential areas and of transportation projects, and of compensation measures under the provisions for impact mitigation regulation (PLANUNGSGRUPPE "OEKOLOGIE+UMWELT", 1998).

Analysis and Assessment

In the landscape plan, the natural components "Species and biotopes", "Soil", "Water", "Air and climate", and "Landscape view and recreation" are considered separately from specific landscape-ecological functions. The results are documented in the text and are entered into combined inventory and assessment maps. Also, special guidelines for development are given for each natural component. Below is an example of a more detailed presentation of the "Species and biotopes" component. This section must contain, among other things, the pertinent framework for the safeguarding of areas significant for the protection of species and biotopes, the creation of a unified system of biotopes, and for judicious implementation of possible compensation measures for harmful impacts on nature and the landscape. Fig. 6 shows a segment of a map of an area west of the town, and provides information both on biotope types and utilisation, and on the significance of particular plots for the protection of species and biotopes.

Species and Biotopes

Forests occupy about 50% of the area of Genthin, and consist predominately of extensive pine stands. Deciduous forests (mostly oak) occupy only small areas rich in nutrients. A few near-natural deciduous woodlands exist, mostly along the northern and southern boundaries. The protection-worthiness of the Genthin woodlands is due both to their large total area and to their relatively untouched and unfragmented state, and to the fact that alder and swamp forests have been preserved in flat floodplains and wet lowlands.

In addition to the woodlands, the relatively extensively used meadows have a high or very high significance for the long-term safeguarding of the capacity and functions of the landscape. An example is Parchen Creek to the west of the town (see Fig. 6). In the area between where it empties into the Elbe-Havel Canal and the east-west rail line, there is a serious conflict with the already approved quarry in this highly valuable landscape. The numerous non-built-up areas in and near residential areas are also of moderate to high significance for the protection of species and biotopes. Moreover, the map segment clearly shows numerous tree-lined avenues and drainage ditches, and a large number of biotopes for which special protection has already been established under Article 30 of the Nature Conservation Law of the state of Saxony-Anhalt.

Among the specific recommendations for the area of species and biotic associations, the priority development of wetland forests, extensively used meadows, and streams is proposed, to permit the creation of a unified system of biotopes, in accordance with the existing assets. Furthermore, it is recommended that pine stands be replaced by mixed and deciduous forest stands, and that the near-natural elements of non-built-up spaces within the city's area be preserved and combined into a single system (PLANUNGSGRUPPE "OEKOLOGIE+UMWELT", 1998).

The Goal Concept

In addition to taking inventory and providing information about the present status of nature and the landscape, the objectives of the landscape plan are to develop statements for the future development of the town. For this purpose, the integrated goal concept must define priority areas for protection, potential areas for residential use, and priority non-built-up areas for development. The goal concept of the landscape plan thus provides the guidelines for predicting potentially harmful impacts on nature and the landscape.

An important point of departure for an insight into the landscape planning development of Genthin is the existing linkage between the residential area and the surrounding landscape. Housing developments must fit harmoniously into the landscape, while the existing boundaries of landscape regions and valuable areas must be preserved. Where no such natural patterns exist, appropriate landscape management measures on the shaping of landscape are in order. The high share of the green space in the town must be generally maintained.

Furthermore, the proposals of the landscape plan include quality improvements of the central parts of Genthin, and the renewal or conversion of former or existing of industrial or commercial areas, rather than using new areas. Besides, the objective is to create a system of non-built-up areas with green-space connections, with walkways and bicycle paths from the urban centre to adjacent landscape regions (Planungsgruppe "Oekologie+Umwelt", 1998). Considering all the natural assets, the especially valuable areas in Genthin include:

- woodlands,
- lowlands,
- the Elbe channel at Genthin, which is important for the protection of the soil, the climate and the groundwater,
- islands of valley sands to the west of Genthin, important for the protection of groundwater, and for landscape maintenance, and
- the Fliessgraben lowlands, particularly important for the protection of the climate and the soil, and for the maintenance of the high development potential of the area.

The Concept for Action (measures and requirements)

The concept for action of the landscape plan identifies the areas for protection, maintenance and development of nature and the landscape in the form of basic areas for priority conservation or development. In addition to the protection, maintenance and development measures, a unified system of protected areas was developed for all of Genthin. In accordance with the local-level nature conservancy goal, the existing and planned protected areas, protected landscape, protected landscape elements or natural monuments, and also biotopes protected under Article 30 of the Nature Conservation Law of Saxony-Anhalt are to contribute to long-term habitat protection. The categories of the protected areas, together with the main measures for the protection, maintenance and development of nature and the landscape, are shown on a map (see map segment in Fig. 7).

In accordance with the goal concept, the priority measures for the protection and maintenance of nature and the landscape include wetland and moist forests stands, near-natural deciduous and mixed forest complexes of special significance as habitats, and wet meadowlands with site-appropriate extensive utilisation practices, and/or special significance as habitats. These also include various bog-embankment associations and dry valley meadows, as well as forest margins, rows of trees, tree-lined avenues, hedges, non-draining water bodies, and old canals. Priority protection and maintenance measures also include valuable areas which do not fit any one of these protection categories, or have not been proposed for such.

The priority measures for the development of nature and the landscape give the township an indication as to the areas in which measures are urgently needed. For such areas, the landscape plan provides basic directions for conservation and development. In Genthin, the areas in special need of development at the same time provide a basis for the township's compensation areas concept. On this basis, the compensation measures derived from the impact mitigation regulation under construction planning or sectoral planning law are to be consolidated and judiciously implemented.

Examples of special development areas include the planned Hagen natural protected area (NSG) (see Fig. 7), where natural deciduous forest associations are to be developed in core zones, and the Parchen Creek and Lowlands development area (see Fig. 7). This is to provide a renaturalisation of the stream, including support measures for its intrinsic dynamics, and the certification of a 20 m wide marginal belt (Planungsgruppe "Oekologie+Umwelt", 1998).

Demands on other land users are particularly addressed to agriculture and forestry users. For instance, from the perspective of the landscape plan, gentle agricultural soil use must be ensured particularly for the soils of the Genthin Elbe channel to the west and north of the town, which are threatened by compaction. Because of the overall lack of protection of the groundwater throughout the Genthin area, the short depth to groundwater and the continuing extraction of drinking water from groundwater, it is necessary to apply a water management regime to prevent pollution. Fallow farmland in non-wooded areas of valley sands should not be afforested, because of the great contribution of these areas to groundwater formation.

An example of the demands placed on forestry is that for a further development of existing deciduous and mixed forest stands of special significance for the protection of species and biotopes to richly structured and layered tree stands. Moreover, "the new planting of site-appropriate deciduous forest stands" is recommended in Water-Protection Zone II around the Genthin water supply station (PLANUNGSGRUPPE "OEKOLOGIE+UMWELT", 1998).

In summary, it may be said that the Genthin landscape plan is recognised in Germany as an excellent example of direct integration of landscape planning into the legally binding zoning plan.

4.4. THE LATEST TRENDS IN LANDSCAPE PLANNING

New Technologies for Interactive Participation

The implementation of new technologies opens up fresh opportunities for landscape planning to achieve an optimum external presentation and a more efficient procedural "interactive" planning process, focused on the involvement of citizens in that process. A comprehensive and easy-to-understand review of the contents of the landscape plan, plus early involvement of addressees in the planning process, adds greater transparency and strengthens the democratic component of the planning process. This also provides a better understanding of and support for the implementation of recommendations, and thus achieves greater efficacy for the already developed plans. The application of digital mass media, such as the Internet, as well as the traditional mass media, thereby provides access to the current issues to a larger number of interested persons, permits their description in a more understandable manner, and opens up new and additional communications links between planners and citizens, independent of the time and place of public meetings, hearings, etc.

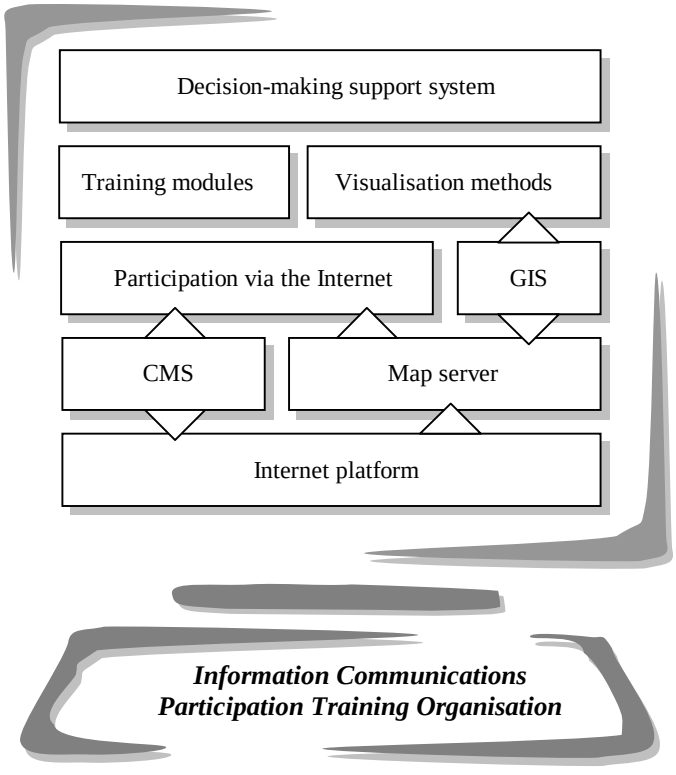


Fig. 8. Interactive landscape planning chart.

With the adoption of the Aarhus Convention in 1998 and the EU Information Directive based on that convention, which is to be transferred to national legislation by 2005, the dissemination of in-

formation on the requirements in the realm of environmental protection and the participation of the public in ecological decision-making in future are to become binding on the authorities. Quality ecological information and simplified access to the courts should provide a basis for improving the transparency of agency-level decisions, and the control exercised by the public, as well as for an enhancement of ecological education and training and of public's environmental awareness (Fisahn, 2004: 137). As a result of the Directive, agencies are to apply new technologies in this area, and to encourage citizens to use the Internet as a source of information and as a communications link. In future in such cases, the documentation on the Internet of the landscape plan as an important source of ecological information is to be standard and routine.

With support from the German Federal Agency for Nature Conservation and the state of Lower Saxony, a functioning, computer-based planning and support system has been developed and successfully tested exemplarily for the township landscape plan of Kunigslutter-on-Elm. The system is modularly based, with each module applicable to solve various problems of interactive landscape planning (Fig. 8).

The central element of the system is the **Internet Platform** (www.koenigslutter.de/landschaftsplan.htm). It contains, among other things, up-to-date information on the current planning process, announcements, and results of public hearings, as well as information about the landscape planning tool. In the interactive mode, citizens can choose to read or upload the draft landscape plan either in a special version or in a "plain-language" short version. With the aid of map elements of the landscape plan compiled via the **Geo-Information System (GIS),** the user can, using the GIS-based **map server** in the Internet, interactively compile maps as s/he may require, and to a limited degree, analysis the map contents and retrieve relevant data (Hachmann, 2004). This information constitutes an important element of the interactive landscape plan (Tiedtke *et al.*, 2003). Interactive multi-media training modules are useful for entertainment-based learning of natural elements for children and adults – e.g. such ecological elements as hedges and drainage ditches – or of environmental issues. These are intended to direct the adult citizens' attention towards the landscape plan via children's games. The Content Management System (CMS) facilitates management, continued updates and addenda of Internet pages in uniform and pictorial presentation (Friese *et al.*, 2003).

The Internet platform, combined with interactive maps, provides a basis for such participatory, interactive online forms as discussions, interactive questionnaires and opinion surveys, and e-mail communications. Of special interest both to citizens and planners is the fact that particular elements on the map, or text passages, can be referenced, and the comments sent in digital form to the local administration, either via a form for comments referenced to the data table of the map server, or via a newly-developed **participation module** which permits placement and labelling of elements onto the maps. It is thus possible to check and correct any errors in the data, or to propose other measures and make instructions regarding the possibility of implementation. The use of these digital forms of participation, including an understandable text, and object and spatial references, considerably reduces the administration's expenses for the analysis of opinions. However, experience to date notwithstanding, the need for "classical" forms of participation cannot be abandoned, as rapid access to the Internet is not yet universally available, and many citizens prefer direct forms of communication such as letters, the telephone or direct discussions at meetings. Still, this functional map-based form of participation is a significant improvement over existing Internet-based forms of planning process participation.

New technologies make possible a two or three-dimensional photo-realistic **visualisation** of various planning proposals and landscape situations – from panoramic images through interactive before-after simulations, all the way to accessible GIS-based virtual worlds – locally, and on the Internet. For Koenigslutter, the use of visualisation to support the orientation and representation of planning proposals has proven to be a success. Discussions at meetings and in working groups, where 3D images have been complemented by two-dimensional maps and aerial photography to ensure orientation, have

been conducted in a judicious, intelligent manner, with the participants extensively refering to the material presented via these media. In addition to explanations of the planners' proposals, citizens wish in future to have very rapid incorporation and display of new proposals, including their own alternatives.

Due to the ever increasing number of viewpoints and relevant information, planning decisions are becoming ever more comprehensive and difficult to understand by those responsible for implementing them. Computer-based **decision support systems** as an element of the planning support process will help process the necessary criteria and information so as to achieve understandable, rational decisions, and will thus have a positive effect on the transparency and acceptability of the decisions made. A system for planning private-sector measures against erosion developed in the context of the interactive landscape plan is an example for subsequently complementing landscape planning via decision-making support at the company level, which can access information from the landscape plan.

The new digital media and online tools for planning support cannot yet – perhaps not ever – replace local direct participation. But they can serve as a judicious complement and, accordingly, be incorporated in the overall concept of the participation and public outreach. Since extensive participation inevitably involves major effort and expense, and typically also extends the planning period, such a concept requires that the local administration be committed to civic and transparent processes. The outcome will be a plan improved by updating and suggestions, and extensive instructions for implementation which can be included either in the plan itself or in a subsequent action concept agreed upon by all parties. Such a "beacon project" can have a favourable effect on the modification and modernisation of management towards a stronger focus on citizens and on the culture of participation (Opperman & Tiedtke, 2004).

Once the project is completed, interested communities and planners will have access free of charge to the components of the system developed and used in the Kunigslutter interactive landscape plan. They can then be used as a basis for other planning tasks, such as participation in the construction planning process.

Modularisation

Due to its interdisciplinary orientation, landscape planning can, even with its existing scope of tasks, make a substantial contribution to solving planning problems in other areas, including e.g. that of Strategic Environmental Impact Assessments (SEA) of general spatial planning and plans for sectoral management under the EU Water Framework Directive (Ott *et al.*, 2004; Herbert & Wilke, 2003). However, some additional topics need to be developed or detailed. Since funding is often insufficient to prepare an effective further development of landscape planning, German specialists favour the concept of modular technological planning with varying basic topics at separate levels of planning (Haaren, 2004a; Vilmer Visionen, BfN, 2002). Accordingly, it is recommended that the modular principle (Bruns, 2003) be used to work out the inherent problems of landscape planning in the context of central modules, and in additional modules where required (Kl, 2004). Inventory representation and assessment of the particular natural assets, and the development of the nature conservancy concept of the goals and measures, are absolutely necessary, and should be regularly updated. Substantive contributions and concepts for the other above-mentioned planning efforts or special questions with respect to the planning area under consideration (for instance, allocation of funds to support organic agriculture programmes, recreation concepts or concepts for the creation of integrated biotope networks – Haaren, 2004a; Bruns, 2003), and also concepts focusing on the other existing tools of implementation, can be additionally elaborated as a service independent of central modules. The procedural and modular preparation of the landscape plan is significantly facilitated through the increasingly common digital processing of data and maps, which permits customisation and updating of the plan and its subsequent use in addressing other issues.

4.5. IMPLEMENTATION OF LANDSCAPE PLANNING TOOLS IN ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

German environmental legislation contains, along with landscape planning, other regulations and tools regarding nature conservation and environmental protection. In obtaining permissions for the construction of facilities, for example, it is necessary to apply the provisions on impact mitigation regulation under Articles 18, 19 & 20 of the German Federal Nature Conservation Law, and to carry out an EIA under the German EIA Law. For sectoral plans and programmes, strategic assessments (SEA) must also be conducted under the EIA Law. The goal of such procedures is to ensure that major projects, such as roads or quarries, avoid, minimise or compensate serious environmental impacts, as much as possible.

Although these procedures refer to particular projects, plans and programmes, their prime objective is nevertheless to preserve nature, the landscape, and the environment as a whole. (German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 1998, p. 15). Therefore, when conducting environmental impact assessments for such plans or objects, it is necessary to use the criteria derived from the overall landscape conservation concept. The ideal tool for such purposes is landscape planning (von Haaren, 2004b, pp. 63 *et seq*.).

For plans and programmes, such as for waste management, the relevant landscape planning can provide data and information, but primarily, too, criteria for environmental impact assessment. It is therefore not surprising that in the preparation of the legal framework for strategic environmental impact assessment in Germany, it has been shown that landscape planning can handle most of the legal requirements for an SEA (BDLA 2004, p. 12). The earlier the landscape programme, the landscape master plan or landscape plan is applied, the more efficiently can environmental conflicts be settled. If special information from the landscape plan is taken into consideration at an early stage, time and money can be saved. Any delay in planning caused by lack of data and assessment criteria can be avoided. Landscape planning also offers the necessary foundations for substantiated compensation for environmental impacts. Lastly, the development and environment quality goals stated in landscape planning can be used to ascertain the degree of environmental compatibility of the plan, programme or project and its impacts (cf. Gassner & Winkelbrandt, 1997, p. 189). Thus, the existence of a landscape plan is an important prerequisite for the assessment of the significance of impacts.

These advantages of landscape planning apply not only to the stage of drafting of plans and programmes, but also to that of the application for permits for the projects. Particularly here, the existence of a landscape plan can contribute to greater attention to interactions and cumulative effects. Landscape planning can thereby prevent deficits in the authorisation process. By providing information, assessment criteria and goals, landscape planning serves as a good aid in orientation for applying other tools of nature conservation and environmental protection.

Gruehn & Kenneweg (1998) have clearly proved empirically the favourable influence of landscape planning on local zoning planning. As a result, the theoretically possible favourable effects of landscape planning claimed at the outset above, have in fact been proven in practice. Zoning plans supported by landscape plans obviously take into consideration a larger scope of nature conservation goals than those lacking a landscape plan (ibid., pp. 252 *et seq.)*. A qualitative effect is also evident. The higher is the quality of landscape plans, the greater the number of goals of nature conservation and landscape maintenance which will be taken into account in spatial planning. Here, Gruehn & Kenneweg refer to "persuasive" landscape planning, i.e. that functions via persuasion and information. In Germany, the same applies to the harmonisation between landscape planning and agricultural planning (Gruehn & Kenneweg, 2002, p. 63).

The favourable influence of landscape planning has been documented not only for sectoral plans but also for particular questions of ecological revision (EIA). It has empiri-

cally been proven that particularly the availability and use of the landscape master plan as a basis for an EIA has a positive influence on the quality of the latter (WENDE, 2000, p. 289 *et seq.)*. Representative selective analysis of 145 EIA procedures has revealed that the quality of ecological data gathering, the description and the assessment of environmental status in EIAs clearly depends on the availability and quality of a landscape master plan.

The connective function of landscape planning is additionally rooted in Article 12 of the German EIA Law, which stipulates that agencies in Germany consider and assess the impacts of a project on the environment in accordance with applicable laws and, hence, with the requirements of landscape planning under the Nature Conservation Law. In this context, e.g. ERMER *et al.* (1996) point out: "There is an increasing awareness that from the perspective of landscape planning, it is also necessary to provide information about conflicts with other kinds of land use, about the environmental impact of projects, and on the resolution of problems related to mitigation regulation and compensation." The results of the cited research projects demonstrate that such a close linkage between planning tools in Germany that has long been discussed theoretically, is now in fact being implemented, and is working. Therefore, landscape planning plays a decisive role and performs the function of a "hinge" between various tools.

5. POLICY RECOMMENDATIONS FOR LANDSCAPE PLANNING

This chapter presents the methodological recommendations for landscape planning for the Russian Federation. Landscape planning is a package of methodological tools used to construct the spatial organisation of society's activity to ensure sustainable nature management and conservation of the basic functions of landscapes as life-maintaining systems. It is a communicative process in which all stakeholders in nature conservation and economic activity are involved in the identification of the interests and problems of nature management, and in which they settle conflicts and draft mutually agreeable action plans.

Landscape planning is implemented as a hierarchical system, in which assessments, planning regulations and guidelines at all levels do not contravene one another, but are mutually complementary, with "allowance for counterflows". Landscape programmes are elaborated for territories of the Russian Federation, and identify the priority areas of nature management and the relevant basic landscape zones. For administrative districts, they cover the medium-scale characteristics of the natural-resources potential, nature conservation tasks, and actual usage of an area, as well as providing recommendations for ecologically sound nature management. For territories of local self-government, municipal territories and sites of high natural significance, landscape plans are designed for the agreed-upon solution to problems related to nature conservation and land use by particular economic entities and authorities at the lowest administrative spatial level, to ensure implementation of particular nature management and spatial development programmes and projects.

It is recommended that a landscape programme be designed as a general purpose map of corresponding scale, with an accompanying brochure with descriptive text. It must not necessarily be published, but it must be available, where possible, to all interested agencies and individuals.

The landscape master plan and the landscape plan represent a sequence of special maps of a corresponding scale with a descriptive text which – upon completion and examination by a local legislative or executive body – are recommended for publication, and it is recommended that maps of the development goals of the planning territory and maps of activities be made available to all interested organisations and individuals at the stage of their primary compilation.

The drawing up of landscape plans consists of five stages:

1. Inventory: acquisition and summarisation of all available information about the natural environment of the territory, its socio-economic conditions, structure, land use characteristics, and identification of the major nature management conflicts in the context of an analysis of the ecological problems of the territory;

2. Assessment of natural conditions, the potential of the planning territory in terms of "significance" and "sensitivity", and of the pattern of land use;

3. Definition of the sectoral target concepts of utilisation of natural resources for each natural component;

4. Development of an integrated target-oriented concept of land use;

5. Generation of the programme of priority areas for actions and measures.

This chapter describes the technique for drawing up the landscape programme, and the landscape master plans and the landscape plans.

The difference between the landscape programme, and its subordinate levels lies in the identification of the basic functional zones of utilisation of the entire planning territory which is implemented with due regard for the principal planning objectives and, primarily, the nature conservancy agenda, the natural-spatial structure, and the level of economic development of the territory, as well as conflict areas of nature management. The elaboration of a landscape programme is exemplified by the ecological zoning programme for the Baikal Natural Territory, which focuses on identification of ecological zone types, which will to some degree determine the economic activities to be permitted there. This goal can be achieved by addressing a dual challenge: How to conserve the Baikal Natural Territory – as the upper hierarchical

level of the landscape planning system – as a World Natural Heritage site, and nonetheless provide sustainable socio-economic development of the territory without prejudicing the rights and freedoms of its residents. In order to identify the types of ecological zones that represent geographical systems with different environmental vulnerabilities to anthropogenic stresses in the form of impacts from enterprises which transform the natural geographical systems or individual components of the landscape, a detailed break-down of the territory has been carried out, based on an analysis of the largest and most significant natural components: the biota, the soil, the climate, and the water; and the elements of economic activity of the population: current and potential land use, and socio-ecological and economic development of the territory. Three ecological zones have been identified in the territory: the central zone that includes Lake Baikal with its islands, the water-protection zone adjacent to the lake, and the specially protected natural territories: the buffer zone – the territory outside of the central ecological zone that includes the watershed area of Lake Baikal within the Russian Federation; and the zone of atmospheric influence – the territory outside of the watershed area of Lake Baikal within the Russian Federation extending up to 200 km to the west and north-west of the lake. In the buffer ecological zone, nine types of zones have been identified, ranging from total prohibition of economic activities (nature reserves) to regulated intense development with maximum impact on the regions' natural environment.

The technique for generating landscape plans involves taking inventory of the natural components (water and biotopes, soil, climate, and ground-level atmosphere, surface and subsurface water, and the landscapes); identifying the conditions of which were taken into account when determining the basic goal of spatial development; analysing the socio-economic environment and the actual land use, the basic criteria and the procedure for assessing the natural components in terms of their "significance" and "sensitivity" categories; defining the sectoral goals of development and the procedure of integrating them into a unified target concept of spatial development; and, finally, developing an agenda of priority policies for action and measures. The technique for working out landscape plans is illustrated using the example of ecologically oriented land use planning for some areas of the Baikal Natural Territory.

5.1. GENERAL

Spatial Levels and Landscape Planning Stages

In the Russian Federation, the administrative structure is fairly different from the federal structure of Germany, primarily with regards to administrative authority and legislative practices. While in the highly developed democratic German society, the lower municipal level plays a crucial role, in Russia, this level is still poorly developed, and its legally grounded functions are only now being built. A more efficient entity for the implementation of the landscape planning procedure may well be the municipal district, a level at which a merger of "top-down" and "bottom-up" appears realistic.

Another realistic prospect is the coordination between the landscape planning and urban planning hierarchies which, in the process of integration, can be significantly enriched both in terms of information exchange and of legal binding (Table 2). The list of planning documents cited uses the following terms and respective definitions and concepts.

Landscape Planning

First, LP is a methodological toolkit used to design a spatial organisation of society's activity within a particular landscape to ensure sustainable nature management and preservation of the key functions of the landscape as a life support system;

Second, it is a communicative process that involves all stakeholders of nature conservancy and economic activity in the planning area, and provides identification of the interests of nature managers, nature management problems, settlement of conflicts, and elaboration of a concerted action plan.

Table 2. Levels and scales of landscape planning and urban planning

Administrative Unit	Urban Planning	Landscape Plan	Map Scale
Entity of the RF Group of units	Spatial planning structure for an entity of the RF	Landscape programme	from 1 : 1,000,000 to 1 : 200,000
Municipal district, Group of districts	Spatial plan for a municipal district	Landscape master plan	from 1 : 200,000 to 1 : 50,000
Territory of local self-government: communities and urban districts	Zoning plan	Landscape plan	from 1 : 50,000 to 1 : 25,000
Parts of a city, neighbourhoods, sub-districts, and other small entities	Spatial planning project	"Green" plan	from 1 : 25,000 to 1 : 5,000

Landscape Programme

This is a general planning document (map plus explanatory text) at the regional level that defines the priority areas of nature management and the respective principal landscape functional zones of the planning territory. It is recommended that such a landscape programme be developed for each entity of the Russian Federation.

Landscape Master Plan

This is a package of maps and texts containing medium-scale characteristics of the natural resource potential, the tasks of nature conservation and actual utilisation of the territory, as well as recommendations for environmentally sound nature management, and for the goals of development of the planning territory; it is recommended that a master plan be compiled for each entity at this level in the Federation.

Landscape Plan

This is a package of maps and texts which are generally identical in composition to those for the master plan, but are intended for concrete solutions in the realm of nature conservancy and land use by particular economic actors and administrative bodies at the lower territorial level. Assessments and recommendations for the landscape plan are based on a large-scale, sufficiently detailed analysis of the planning territory to provide for implementation of particular nature management and spatial development programmes and projects.

In general, landscape planning is carried out as a hierarchical system, in which assessments, planning policies and guidelines at any level are not contradictory to those at other levels, and are coordinated under the "allowance for counterflows" principle, under which framework recommendations ("top-down" proposals) serve as benchmarks for more detailed instructions at lower planning levels, but are themselves reshaped under the influence of "bottom-up" proposals.

It is recommended that a landscape programme be organised as a survey map at a corresponding scale, and as a brochure with an explanatory text for the map. The landscape programme need not necessarily be published, but it must be made available, where possible, to all interested entities and individuals.

A landscape master plan or landscape plan constitutes a sequence of ten to twenty special-purpose maps at a corresponding scale, together with explanatory text, consisting of no more than two to five printing sheets. Upon completion and examination by a local representative or executive body, it is recommended that the maps, with the explanatory texts, be published, while the maps identifying the objectives of planned development and the maps of

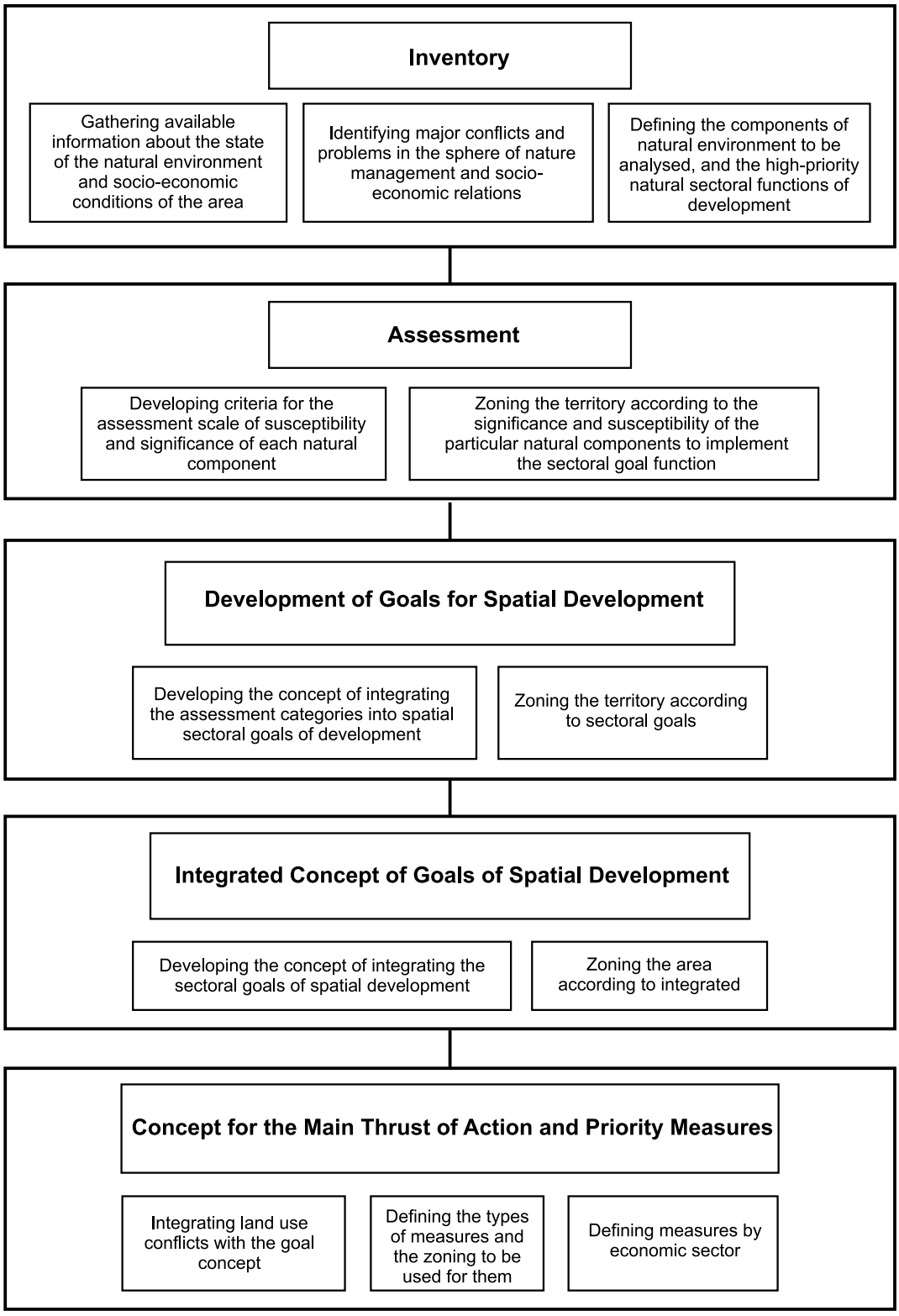


Fig. 9. Stages of landscape planning.

activities (see the sections on the technique for drawing up plans below) be made available to all interested organisations and individuals at the stage of their primary compilation. The generation of landscape plans has a standard format, and normally consists of five basic stages (Fig. 9):

1. ***Inventory*** – the gathering and summarising of all available information about the natural environment of a territory, its socio-economic conditions, structure and land-use patterns, and the identification of the major conflicts of nature management within the context of an analysis of the territory's environmental challenges;
2. ***Assessment*** of the natural conditions of the planning territory, and its potential in terms of the categories of significance and susceptibility, and also appraisal of the manner in which the land is are used;
3. ***Definition*** of the sectoral target concepts of utilisation of natural resources for each natural component;
4. ***Development*** of an integrated target-oriented concept of spatial management; and
5. ***Drafting*** of an action plan.

5.2. LANDSCAPE PROGRAMME

General

The landscape programme, the uppermost level of the landscape planning system, identifies the functional goals of utilisation for the entire planning area, with consideration for:

- the principal objectives of planning, and, primarily, nature conservancy problems;
- the natural-spatial structure and the degree of economic development of the area; and areas of potential conflict in nature management.

Developing a landscape programme involves identifying the following functional zones:

Zone A – *Conservation of Areas in Greatest Need of Protection*

The prime objective is to achieve priority preservation of contiguous areas with natural or near-natural ecosystems. These areas have a high or very high value for species and biocoenoses conservation. All utilisation, even extensive, is discouraged in this zone, even if it had earlier been guaranteed high profitability.

Zone B – *Conservation of Extensively Utilised Areas*

The prime objective is to achieve priority preservation of extensively utilised landscapes, such as forested areas with a high proportion of near-natural stands, or extensively utilised cultural ecosystems, or an alternation of farmland and forest. This includes, first, historic cultural landscapes, where particular emphasis should be placed on the preservation of the function of landscape components. This is true for particularly typical landscapes and small-sized complexes that create the prerequisites for the preservation of extensive forms of utilisation. Regulated promotion of forms of recreation suitable for the landscape is possible. Further development of residential centres is limited to fulfilling existing needs, and the expansion of the infrastructure, especially for transportation, is banned.

Zone C – *Priority Improvement of Especially Vulnerable Areas*

The prime objective is to achieve priority improvement of the function of natural landscape elements and of the condition of areas in use by changing the intensity or type of use. This includes first, vulnerable areas in which the type and degree of land use far exceeds permissible loads, which poses problems e.g. for the groundwater and the soil, and for extensive forest stands.

***Zone D** – Conservation of Natural components in Agricultural Landscapes*

The primary objective is to preserve the function of the natural environment in agricultural areas via conservation of existing natural structures and extensively used lands. This includes general and specific land improvement goals, such as protection of subsoil water and the soil, and ensuring natural succession in small forests biotopes, forest margins and groves in fields, and forest stands around shallow water bodies.

***Zone E** – Conservation of unused areas, and of the natural environment in residential centres*

The prime objective is to achieve preservation of the required quantity and quality of unoccupied green spaces in major residential centres and their surroundings, and to establish green open areas; to intersperse the residential areas with green biotopes similar to natural landscapes, in order to:

- create functional links with undeveloped areas (especially in near-by suburban agricultural and forest land);
- provide recreational facilities; and
- provide protection against pollution and noise.

***Zone F** – improvement (including rehabilitation) of intensively used areas*

The prime objective is to eliminate harmful burdens and provide rehabilitation of the environment in those areas where these burdens caused by environmentally harmful economic activity and by the lack of adequate nature conservancy measures present a serious threat to humans and the environment.

The examples cited of selecting functional zones, as suggested by the Hanover landscape planning firm Ecology & Environment in developing a landscape programme for one of the new eastern states of Germany, show that the content and principles underlying the development of landscape programmes are similar to the approaches and policies used in Russia in compiling so-called Territorial Integrated Nature Conservancy Frameworks (TerKSOPs). To a certain extent, these correspond to the principles of district planning, although in the latter, the urban planning approach, a rigid focus on zoning, and the subordination of environmental interests, predominates in practice.

Ecological Zoning of the Baikal Natural Territory as an Example of a Landscape Programme

Currently, Russia has no commonly accepted standard techniques for developing spatially-based regional ecological programmes, nor are there any programmes for extensive, unique natural sites, such as the Baikal Natural Territory (BNT) that includes the World Natural Heritage Baikal site. The surface area of the BNT, which includes four entities of the Russian Federation, totals 386,390 km^2, or approximately the same as the total area of Germany. Considering its very great significance for all humankind, such a large area urgently requires the development of a landscape programme capable of pooling the efforts of various strata of society and of government agencies to focus on the preservation of Lake Baikal's unique ecosystem.

The specific character of the landscape programme as the upper hierarchical level of the landscape planning system implies identifying the main functional zones of utilisation of the entire planning area, for the purpose of preserving the unique eco-system of Lake Baikal, and avoiding detrimental impacts on it from economic and other activities. Developing such a programme requires an analysis of the natural-spatial structure, anthropogenic loads on geo-systems, and existing and potential restrictions of economic activity.

The prime objective of the landscape programme for the Baikal Natural Territory is to typify ecological areas in which economic activity could in some way be regulated. It is possible to achieve this objective by concurrently addressing two issues: the conservation of the Baikal Natural Territory as a World Natural Heritage site, and the safeguarding of the sustainable socio-economic development of the area without prejudice to the rights and freedoms of those living there.

Thus the programme is based on a spatially differentiated approach to identifying types of ecological zones. They represent geographical systems with a variety of different environment-shaping significances and resiliencies to anthropogenic loads. They are affected differently by economic activity that transforms the natural geographical systems or individual landscape components.

The prime objective of programme-based planning is a detailed analysis of the Baikal Natural Territory and its most significant natural components: the biota, the soil, the climate, and the water, as well as the economic activity of the population: present and potential land use, and the socio-ecological and economic development of the territory.

For the territory of the ecological buffer zone of the BNT, the catchment area of Lake Baikal within the borders of the Russian Federation, an analysis was made of sixteen thematic blocks; the texts of the programme are accompanied by sixteen thematic maps. The programme contains varied, unbiased qualitative and quantitative information on the situation, largely of the past several years. The programme was elaborated via a number of steps:

- The inventory-taking phase, involving the gathering and summarising of all available information about the natural environment and socio-economic conditions of the area, and its land-use structure and patterns;
- The assessment phase, focusing on an assessment of the character and degree of land use, as well as the present natural conditions in terms of the categories of "significance" and "sensitivity";
- The elaboration of target concepts of natural resource utilisation for various natural environments in terms of the categories of "conservation", "improvement", and "development"; and
- The generation of integral target development concepts/ ecological zoning for the BNT.

The sectoral concepts were integrated by combining the development goals of separate natural environmental components – biota, soil, climate – using the same goal types (conservation, development, and rehabilitation) and with due regard for the present and long-term economic development of the area. Moreover, the socio-economic problems and resource assessment of the area were taken into account as an important factor of spatial target differentiation. Whenever there was a mismatch of the areas covered by the types of sectoral goals, the priority principle was used. Top priority was assigned to conservation tasks, followed by rehabilitation. Areas not assigned to the first two types were designated for development.

Landscapes that constitute the environmental-shaping matrix of the area or have unique or aesthetic value, are removed from utilisation and are combined into a single zone designated primarily for conservation. The existence of such a zone will guarantee the maintenance of the natural environment-shaping landscape functions of the area as a whole, save natural resources, and ultimately preserve the unique character of the landscapes and the natural diversity of the Baikal basin. Depending on the significance and susceptibility of natural complexes, the regimes within this zone of utilisation may differ. For especially valuable landscapes that represent the environment-shaping core of the area, conservation means complete abandonment of utilisation in favour of, a nature reserve-like regime. For the other natural complexes of this zone, existing types of utilisation can continue, provided they are transformed to extensive use with due regard for ecological requirements. New types of economic activity or expansion of existing utilisation are ruled out in this zone.

All landscapes that have been disturbed in the process of utilisation are combined into a single zone for improvement and rehabilitation. The duration and technology for such rehabilitation may differ according to the character and degree of damage.

The landscapes of high environmental safeguarding potential constitute the area recommended for top priority planning of existing and planned utilisation. This does not

necessarily mean that nature conservancy policies are to be abandoned for this area; it merely implies that the organisation of nature management here involves fewer risks for the environmental status of the area as a whole. Considering the particular level of environmental-safeguarding properties inherent in the landscapes of this zone, the forms of utilisation can have only extensive character. This zone is designed for economic activity of the population. Its economic capacity and resource potential can provide further socio-economic development of the area without intense forms of land use and with no risk to the ecological condition.

Such a procedure is instrumental in identifying areas recommended for conservation of the natural environment and for socio-economic development: it is necessary to define the areas facing the most acute ecological challenges, where special rehabilitation measures should be undertaken, and to plan such measures; to specify the development direction of the area, and to concretise the basic patterns of this development. This provides a way of distinguishing – at the spatial level – between ecological and socio-economic problems in the area itself, followed by defining the action plan for optimisation of the measures in each of the zones.

The Ecological Zones of the Baikal Natural Territory

In the ecological buffer zone of the BNT, nine types of ecological zones have been identified – ranging from a total ban of the economic activity (nature reserves) to regulated intense development with maximum environmental impact on the region. In between are categories of ecological zones with their own regimes of prohibition and permission (Fig. 10).

Type 1 Ecological territories (nature reserve regime) includes the Dzherginsky nature reserve in the Republic of Buryatia, and a portion of the Sokhondinsky nature reserve in the Chita region. They have predominantly mountain-*golets* (barrens) and mountain-taiga landscapes. They are legally certified and delimited.

Type 2 This includes nature reserves, national parks and their buffer zones. They are also legally certified and delimited. Seventeen nature reserves and the eastern part of the Tunkinsky National Park exist in various natural conditions and in different types of landscapes, such as *golets*, taiga, steppe and lake-swamp. The area management is that of the temporary abandonment of economic utilisation. For some areas, recreational utilisation with insignificant environmental impact is recommended.

Type 3 Ecological management. This includes undeveloped mountain areas far from major residential areas and places of economic activity. They occupy *golets*, steeply-sloping mountain-taiga landscapes with intense occurrence of exogenous processes. Their current practical uses include commercial hunting, gathering of wild-growing herbs and fruits, and tourism. This type has been identified on the basis of high significance and high sensitivity biotopes that act to conserve the equilibrium of naturally occurring processes and provide for species diversity, including rare, endangered, threatened and endemic species.

Type 4 Existing extensive utilisation. These are primarily piedmont and mountain-taiga landscapes with gentle hillsides of medium height and low mountains. They include biotopes, soils and landscapes of moderate and low significance and high sensitivity to anthropogenic stress, with widely occurring biotopes and disturbed species composition of recovering plant and animal communities. Forest utilisation predominates.

Type 5 Ecological areas; this includes the zone of extensive development (agriculture, transportation). Its landscape composition includes steppe bottoms and forest-steppe, sub-taiga and meadow-swamp geo-systems. They are of high and moderate significance and have low sensitivity to anthropogenic stresses. The main economic utilisation is livestock breeding and pipelines/ and power transmission lines.

Type 6 Regulated intense development. The main types of economic management include industry, civil construction, mining, transportation, and agriculture. Many opportunities for medical and human rehabilitation uses are possible here. This type is charac-

terised by high significance landscapes and their components with moderate and low sensitivity to anthropogenic stresses. Typically, they occupy valley, piedmont steppe and sub-taiga landscapes. This zone also includes areas of proven and commercially usable deposits of mineral resources. Because of their high value for the economy of the Republic of Buryatia and the Chita region, and their contribution to the safe development of the Lake Baikal ecosystem, they may be assigned to this category.

Type 7 Ecologically very problematic areas. This provides a package of measures for the improvement of the ecological situation near large residential areas, in areas subject to pollution from industrial centres, and along heavily travelled highways. These areas feature disturbed natural functions, high economic and aesthetic value and moderate environmental-protective potentials. The landscapes are largely valleys.

Type 8 Areas intended for improvement, with a priority package of measures involving rehabilitating forests, grasslands, and other agricultural lands, as well as re-cultivating lands disturbed by mining. The landscapes have moderate and high environmental-protective potential, with possible recovery of natural functions, and hence an alternate means for expanding the zone of extensive development.

Type 9 Rehabilitation zones of strongly disturbed high sensitivity landscapes with low environmental-protective potential. They include landscapes of deflated sands, and areas planned as nature reserves in future. The improvement stage does not permit any practical use of the area. Following improvement, the area is assigned to the category of conservation and regulated recreational utilisation.

An important aspect of the programme developed for the BNT is the principle of clear functional definiteness of the types identified for the conservation and improvement of the Lake Baikal ecosystem. Of no small importance is the fact that the aforementioned types are all mutually complimentary, which not only helps resolve ecological problems, but also creates the conditions for proper socio-economic development.

5.3. THE LANDSCAPE PROGRAMME OF THE KALININGRAD REGION

During 2004 and 2005, the Kaliningrad Region hosted the signing of the international Landscape Planning of the Kaliningrad Region agreement entered into by the Russian Immanuel Kant State University and the Berlin University of Technology, with the participation of the V.B. Sochava Institute of Geography SB RAS, and with support from the German Federal Agency for Nature Conservation, Deutsche Bundesstiftung Umwelt (German Federal Foundation for Environment), and the Administration of *Rosprirodnadzor* for Kaliningrad Region.

At a level of the entities of the Russian Federation, of which the Kaliningrad Region is one, it is recommended that planning efforts begin with the development of a landscape program, a regional-level survey planning instrument consisting of a map and an explanatory text, defining the main landscape functional zones and the respective goals for the ecologically oriented use of the territory, in order to permit scientifically well-grounded administrative decisions regarding the optimisation of current and future nature management [Antipov et al., 2002, 2005; Handbook of Landscape Planning, 2001).

The landscape program for the Kaliningrad Region is a strategic planning document regulating the utilisation of the territory, and providing the informational and legal base for a wide range of developers and decision-makers, governmental and non-governmental nature conservancy and ecological foundations and endowments, and international organisations in the field of ecological control and management.

The programme involved addressing the following goals:

-An assessment the land and water areas of the Kaliningrad Region according to the significance and sensitivity of the main components of the environment (surface and subsurface water, climate and air, soil, species and biotopes, and the view of the landscape) on a cartographic basis;

-A definition and integration of the targets of utilisation of the environmental components and the, drafting of a target concept of development for the Kaliningrad Region;

-The identification of nature management conflicts, so as to permit their resolution;

-A conceptualisation of ways to implement the landscape program of the Kaliningrad Region; and

-An update of the existing territorial development plans.

In order to develop the landscape programme, the experts collected and analyzed an extensive database, including archival data from the Kaliningrad Centre for Hydrometeorology and Environmental Monitoring, the Kaliningrad Integrated Geophysical and Hydrological Expedition, and the State Centre of the Kaliningradsky Agrochemical Service, the Forestry Agency for the Kaliningrad Region, the Administration of *Rosprirodnadzor* for Kaliningrad Region, and many other organisations (Fig. 11).

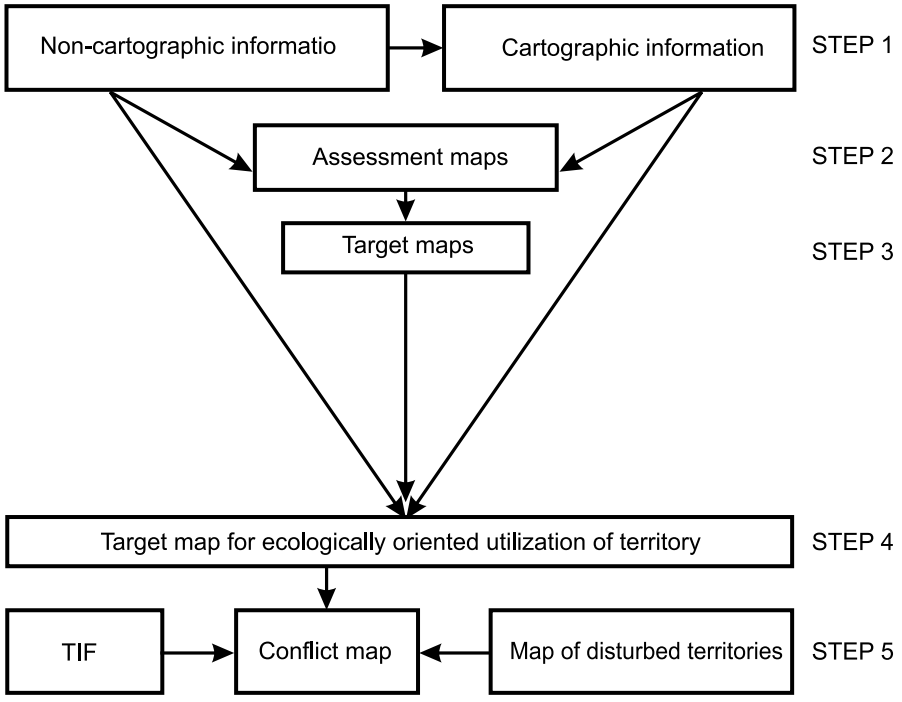


Fig. 11. Basic information structure, and project implementation steps.

The program also relies heavily on the data from the state land and water registers, the data-bases maintained by the Bio-ecology and Geo-ecology Departments of the Kant State University, the Bio-resources and Nature Management Departments of the Kaliningrad State Technical University, the Kaliningrad Division of the Russian Botanical Society, the Architecture and Urban Planning Administration, and the Regional and the City Societies of Hunters and Fishers.

In the first stage of work, it was anticipated to obtain as complete as possible a set of objective information about the state of the natural environment in the planning area. To this end, an assessment was made of the main natural components according to the "significance" and "sensitivity" categories.

The assessment of the significance of species and biotopes took into consideration the landscape-biotopic structural features of the geo-systems. Criteria that rely on assessments of a current state of ecosystems of Kaliningrad Region, the spatial distribution of rare species of plants and animals, especially valuable habitats, and a general level of biodiversity, were used as the basis for identifying areas of varying significance. In assessing the sensitivity of species and biotopes, account was taken of the multi-actor character of hazards to biological diversity (lumbering, drainage amelioration, forest fires, agriculture, mining operations, infra-structural development, civil construction, poaching, recreational load, and other types of human activity), the intensity and duration of the factors, as well as the restoration ability of the main components of the ecosystems.

In terms of hydrological indices, the region is largely homogeneous. The ability of a particular portion of the territory to form surface runoff was used as the basic significance criterion for surface water. In addition, the special significance of certain water bodies was considered. Sensitivity was assessed on the basis of the ability of a given area of the river basin to regulate surface runoff and respond to changes in it. Finally, the ability of the water bodies to resist pollution was considered.

Assessment of the significance of the soil used the criteria of uniqueness and purposes of utilisation of soils, on the one hand for the preservation of plant communities, and on the other for agricultural production. The degree of sensitivity of soils was inferred from the potential development of water and wind erosion under the impact of various man-made stresses.

Central to the assessment criteria for the significance of landscapes was the proposition that valuable scenery must excel primarily by a high degree of naturalness and low level of secondary (anthropogenic) elements. The aesthetic value of the landscape is determined by the contrast of topography, the structure of vegetation cover, and the presence of water bodies. In addition, the valuable attributes of scenery included its panoramic and multi-faceted character, and the colour, brightness and spatial structure of the objects within the field of view; account was taken of the characteristics of the main landscape areas of Kaliningrad Region, and the recreational and resource potential of individual territories. Landscape sensitivity assessment was based on a potential possibility that they would loose their aesthetically most attractive elements, while the physiognomic aspect of vegetation, and the state of the main plant communities served as an indicator of the magnitude and rate of such losses.

Assessments of subsurface water were made in terms of a combination of the area's run-off regulation and water-protective potentials. The water-protective function was regarded mainly as being responsible for the water quality composition and water protection against pollution and contamination. The significance of the state of a territory's water resources (effluent run-off) was determined as the water-resource potential of landscapes, with due regard for drainage conditions. Sensitivity was estimated on the basis of the run-off regulation ability of an area using data on moisture capacity of soils, degree of regulation of water yield from the zone of free water exchange, permeability of sediments within which seepage flow is formed, and gradients of the terrain.

The climatic conditions were assessed on the basis of the goal of climatic resource utilisation for recreational, agricultural and wind-power engineering purposes. The assessment was carried out in an integral fashion by taking into account the circulation patterns of the atmosphere, the meso-climatic variability of the basic meteorological indices under the influence of the Baltic Sea, the breeze circulation, and the relief and landscape diversity of the territory. Meso-climates were mapped based on the landscape-climatic approach, with due regard primarily for the geo-morphological basis of spatial non-homogeneity of the environment.

The second stage of work included zoning the planning area according to type of targeted utilisation of each component of the environment. The "preservation of the present state" target stipulates a mandatory or prevalent preservation of a valuable component of the environment in its present state in the planning area. The "development" target in-

volves an extensive or intensive development of the area, over the course of which a given component of the environment may be changed, while retaining its principal properties and functions. The "improvement" target is realised in areas that have lost their original functions, and implies abandoning any utilisation in existing forms, subject to subsequent restoration.

GeoMedia Professional, ESRI ArcGIS, and Mapinfo GIS were used in processing and analysing input data. The technique for generating the target maps, and the maps of nature management conflicts and disturbed areas, were based on spatial analysis via the GeoMedia geo-information system, and software products developed by the project participants on the basis of the OLE Automation technology. The target layers of the maps were obtained from results of spatial intersection and combination of corresponding layers of assessment maps.

The integral map of the targets of ecologically oriented utilisation for the Kaliningrad Region (Fig. 12) was generated by computer-aided processing of the component target maps, followed by their editing by experts using the system of "priorities" of natural components developed by them. This system made it possible to optimise the relationship of the areas that were recommended for various purposes. The maps of development targets for separate components of the environment were combined and compared with the map of disturbed areas.

The integral "preservation of the present state" of the area according to the environmental significance and character of its current economic utilisation is subdivided into "mandatory preservation" and "predominant preservation". Areas of greatest significant importance for the region were assigned to mandatory preservation (abandonment of economic utilisation). They include unique and particularly valuable environment-shaping ecosystems with a high level of biodiversity, very close, both structurally and functionally, to the natural form, constituting the base for the natural framework of the region. The zone of prevalent preservation (protection with eventual regulated utilisation of some of the areas) included highly significant (for the region) environment-regulating ecosystems, similar to natural ones, constituting the major portion of the natural framework of the region and incorporating important biodiversity components.

The integral "development" target stipulates either an intensive or extensive utilisation of an area, in the course of which the complex of environment components can be altered, but largely retain their properties and functions. According to the trends of current and future economic utilisation of the territory, the "development" target is subdivided into two categories: "extensive development", and "intensive development". Extensive development (with the preservation of existing landscape components and of the most valuable ecosystems) encompassed transformed (to a different extent) areas and water bodies that are important for keeping the ecosystems stable, and for ensuring the environment-regulating function due to their role as ecological corridors and refuges. The "intensive development" target (combined with optimisation and improvement measures for the main landscape components) includes highly significant areas at different stages of anthropogenic transformation of the landscape, with agricultural areas predominating.

The integral "improvement" target refers to territories that have lost their environment-shaping and environment-regulating functions, composition and structure of the main components as the result of economic activities. To achieve this goal, it is necessary to abandon utilisation in the existing form, and implement a package of measures aimed at rehabilitation and recultivation for subsequent restoration of the environment-shaping functions of the area. It was planned to assign to "improvement disturbed areas" sites of varying significance at the stage of major anthropogenic landscape transformation or degradation, such as dumps, quarries, heavily polluted streams and water bodies, peat extraction areas, disturbed segments of the shore area, etc.

The high degree of development and dense population of the Kaliningrad Region are responsible for serious current and possible future nature management conflicts in the

territory [4, 5]. Nature management conflict would contradict the territorial priorities of nature conservation and economic development under a definite nature management regime that implies an actual or potential degradation of the natural complexes of the territory or of its major components, or a decline in the diversity, productivity and value of the landscape, and in the total effectiveness of the economic functions of the territory.

The nature management conflict map (Fig. 13) was generated by combining the integral target map, the map of disturbed territories, and the territorial integrated urban planning maps for Kaliningrad Region.

The map (Fig. 13) identifies actual and potential nature management conflicts. Existing nature management conflict are characterised by current clearly pronounced adverse consequences of anthropogenic modifications of the environment that manifest themselves primarily in ecosystem pollution, depletion of natural resources, degradation of natural landscapes, declining biodiversity, human health impairment, worsening of the operating condition of technological systems, and in quality deterioration and a drop in production of various industries related to the utilisation of natural resources. With an increase in nature management intensity or with a decline in efficiency of environmental measures, it is highly probable that potential conflicts could turn real.

According to the degree of acuteness, the conflicts are classed into three categories: very acute, acute, and moderately acute. A separate block includes relatively conflict-free areas. For identifying the particular conflict categories, three types of criteria were adopted, which are ranked according to the degree of their manifestation: the degree of compatibility of territorial priorities relating to nature conservation and economic development under a particular nature management regime; the degree of anthropogenic transformation of the territory's natural components, and the degree of reversibility (restoration) of anthropogenic transformation of natural complexes.

Of fundamental significance for defining a particular category of conflict is not only its acuteness, but also its duration and recurrence. In this context, conflicts can be categorised as persisting, long-lasting, seasonal, rare or intermittent.

Actual conflicts in nature management that have been identified for the territory of the Kaliningrad Region are usually brought about by mining operations (extraction of building materials, peat or petroleum), unauthorised lumbering, disturbance of plant associations, pollution of and man-made alterations to river channels, water erosion, and overgrazing.

According to the degree of acuteness of nature management conflicts, two types of territories were defined: conflict-prone (with very acute, acute and moderately acute conflicts predominating), and relatively conflict-free (with weak conflicts predominating, or none existing). Most of the territory is characterised as a relatively conflict-free or moderately conflict-prone. The least conflict-prone areas are mostly agricultural lands.

Experts carried out a certification of the most acute conflicts in nature management for the Kaliningrad Region. For each particular target of ecologically oriented use of the territory of Kaliningrad Region, they defined and recommended protective measures and actions.

To implement the landscape program and endow it with the status of a binding document will first require:

- Legislative approval of the landscape program as a fundamental document of territorial planning and strategic utilisation of the region's land resources by an ordinance of the Kaliningrad Regional Governor;

- Establishment of a management department for specially protected natural territories as an independent structure at the Kaliningrad Regional Government;

- Revision of the law that regulates the establishment of specially protected natural areas at the regional and local levels; and

- Establishment of a regional network of specially protected natural areas, and improving their regime .

5.4. MEDIUM-SCALE LANDSCAPE MASTER PLAN (1:200,000) (EXEMPLIFIED BY THE GOLOUSTNAYA RIVER BASIN)

Inventory Stage

The inventory stage involves gathering and summarising all available information about the area's natural environment, its socio-economic conditions, and land use patterns and practices, and identifying the major conflicts in the "social environment – nature management" system by analysing the ecological challenges facing the area.

The implementation of this stage involves inventory maps at a scale of 1:100,000, and a listing of the basic challenges and conflicts in the planning area. The composition and information coverage and content of such maps should reflect the current status of the natural environment, and the patterns and practical uses of the area.

Compiling inventory maps involves analysing the natural components, the state of which is considered when the basic goal function of spatial development is defined. Usually, such components include:

- species and biotopes,
- soils,
- climate and ground-level atmosphere,
- surface and ground water, and
- landscapes.

Furthermore, this stage involves analysing the socio-economic environment, and the actual utilisation of the area. This list is tentative and can vary with natural features of the area, and with planning tasks.

Cartographic and non-cartographic archival and stock documents from various agencies can serve as the major source of input information needed to compile inventory maps. The sources of information used to compile inventory maps for separate natural components and for the socio-economic situation are presented in Fig. 14.

In analysing the natural conditions of the area and, in particular, in determining the character and degree of its anthropogenic disturbance, it is recommended that use be made of material from the spatial planning process, the Territorial Integrated Nature Conservancy Plans (TerKSOP), and annual reports on nature conservation. As an example, Figs. 15 and 16 present portions of inventory maps at a scale of 1:100,000 for the basin of the Golustnaya river, which flows into Lake Baikal.

In compiling inventory maps, it is also recommended that specific investigations and surveys be undertaken: single thematic expedition-based surveys of the area, such as geo-botanical, geochemical, hydrometric, hydro-chemical, soil, and other surveys; permanent station-based comprehensive investigations in representative areas, and surveys of local residents using targeted questionnaires. As mentioned above, a notable goal of the inventory stage is to reveal the interests of nature management stakeholders, as well as to analyse the problems and conflicts in this regard. Even at this stage of landscape planning development, it is therefore recommended that consultations be held with all interested organisations and individuals, and the public at large be widely informed about the policies and practices of landscape planning through the mass media, specialised publications, open hearings, and other similar mechanisms.

Assessment Stage

The assessment stage is for assessing the status of the existing natural conditions in the planning area. The assessment should meet the following requirements:

- They should focus on the principal purposes of land use in circumstances where there are identical priorities with regards to the preservation of the ecological equilibrium and sustainable socio-economic development;
- They should fully reflect the current state of the environment, both in naturally occurring ecosystems and in those modified by economic activity; and

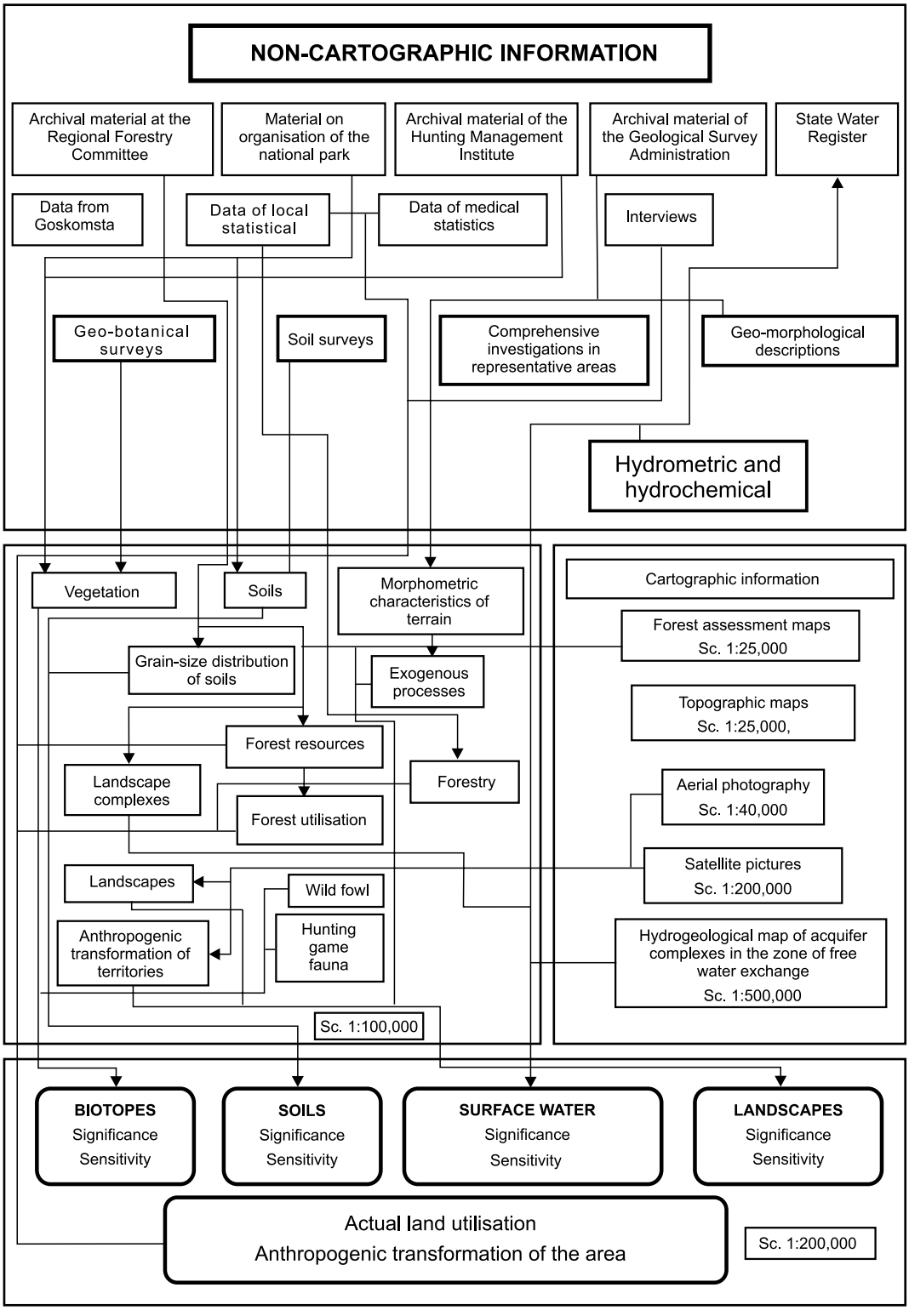


Fig. 14. Structure of input information, and flow chart for obtaining the results in the first and second stages of generating the landscape master plan.

· They should provide insight into the likely changes in the conditions of separate natural components introduced by implementing the priority uses of the area, and into the allowable level of such uses.

These requirements are embodied in the categories of "significance" and "sensitivity" of the individual components of natural environment and are presented in Fig. 17.

The category of ***"significance"*** is used here in reference to the level of compliance with stipulations of the status of a given natural environmental component, assessed by experts. This correspondence is only considered in relation to a successful or optimal implementation of the priority goal of utilisation unique to each natural component. The level of correspondence is determined via a set of criteria which take into account the specific character of the object being assessed and the goal function of utilisation.

For each natural component, the respective set of criteria and their integration into the categories of "significance" and "sensitivity" has its own specific features.

When assessing the ***species*** and ***biotopes*** in the category of "significance", it is recommended that the following be considered separately:

· places where rare flora and fauna species are concentrated;
· biotopes outside the biotic zone; and
· areas near agricultural lands easy for the fauna to reach, and the surroundings of populated areas, and summer cattle grazing and watering areas.

It is recommended that the significance of biotopes as habitats be assessed on the basis of an analysis of the data at sites of rare, relict and endemic plant and animal species, with due regard for the structural properties of vegetative cover, and the occurrence frequency and distribution of relevant areas in the planning area, as well as with consideration for the composition of the animal population and its dynamics.

According to their significance, the biotopes can be categorised into three groups:

· High significance: These include biotopes where the initial (potential) and existing environmental conditions are nearly identical (habitats of rare, endemic and relict flora and fauna species; rare biotopes; and biotopes that are relatively widespread, yet in definite conditions only);

· Moderate significance: These include biotopes in which the existing (or recoverable) state of the natural environment approximates the potential; and

· Minor significance: Where the current state of environment differs from the original.

Fig. 18 presents the algorithm for determining the significance of biotopes for the Golustnaya river basin, as well as a portion of the map generated following the technique described above (Fig. 19).

It is recommended that the ***soils*** in the category of "significance" be assessed, based on the goal function of soil utilisation.

For areas with natural vegetative cover, it is recommended to use as the assessment criterion for significance the ability of plant communities to sustain natural biological productivity. For forest lands for example, forest quality is used as the productivity index. Assessments are made on a historic-genetic basis.

Furthermore, the reserves of timber are taken into account for each type of forest, corrected for stage and completeness of stands; the linkage of vegetation (native or derivative) with the types of soils is established, and the following soil indices affecting forest quality are involved in the analysis: completeness of soil profile development, the thickness of the humus layer, agrochemical properties, granulometric composition, rockiness, the degree of swamping, the presence of permafrost and salt accumulation, and hillside steepness and exposure.

All other factors being equal, the forest-growing properties are higher on calcareous soils, as these create favourable conditions for intense activity of nitrogen fixers and humus accumulation, which substantially aids soil fertility. Productivity of forest lands is

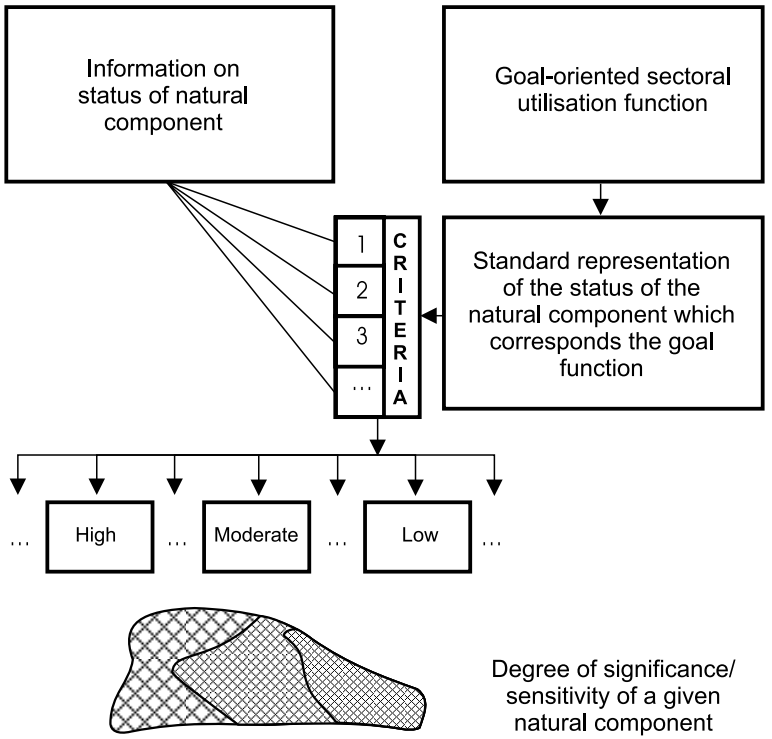


Fig. 17. Flow chart for assessing the significance/ sensitivity of a single natural component.

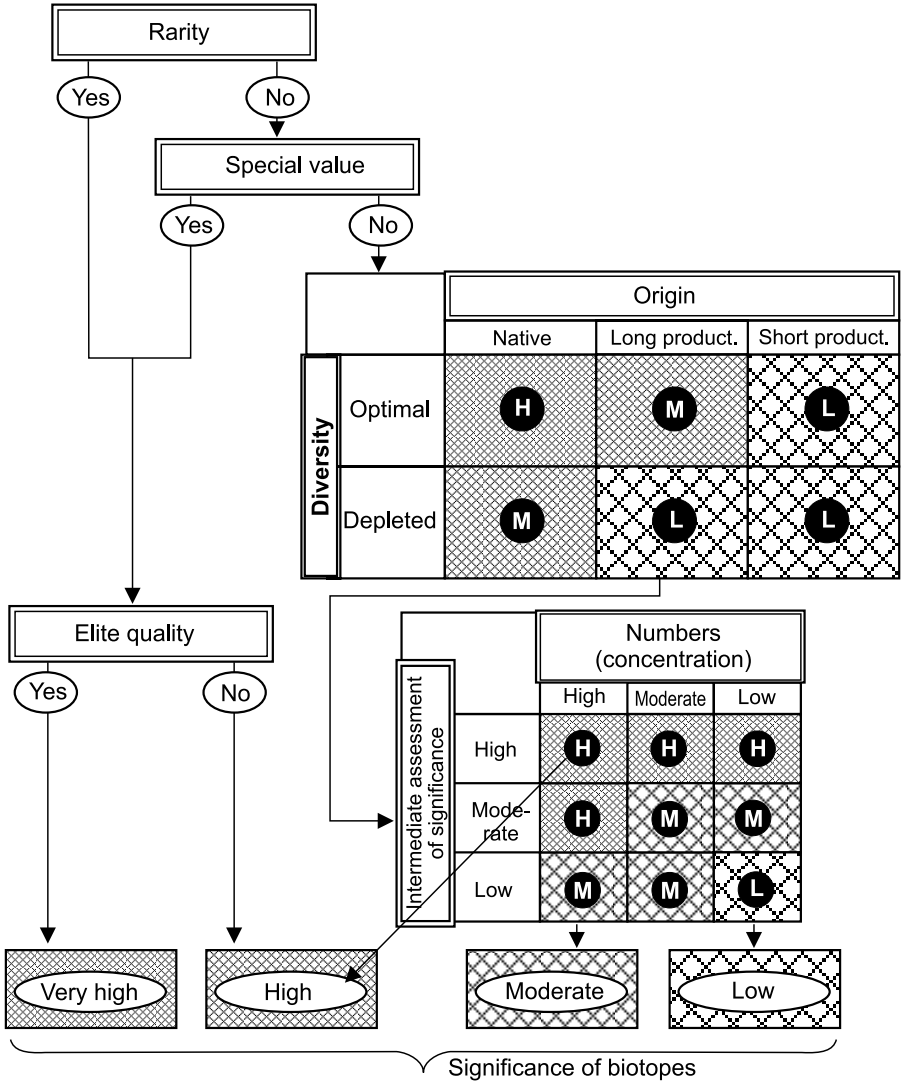


Fig. 18. Flow chart of successive assessment of the significance of biotopes.

associated with the type of humus that reflects the trend of the mineralisation and humification of litter, and the intensity of biological cycle.

The most important indicator for agricultural lands is soil productivity. Its qualitative assessment is based on objective soil characteristics which are closely linked to productivity, and is carried out with due regard for the soil quality. Thus, an assessment of the suitability of soils for grazing or hay-making is based on such parameters as heat and moisture availability for plant communities.

In assessing the soils for degree of suitability for agricultural use, it is recommended to use, in addition to heat and moisture availability, such indicators as thickness of humus layer, humus content, availability of nutrient elements, (pH) reaction, capacity of cation exchange, granulometric composition, gradients of terrain, the area of profile, etc.

Furthermore, it is recommended that soil assessment maps indicate areas with extreme conditions for agriculture: precipitous hillsides nearly devoid of soil or vegetative cover; semi-fixed and deflated sands with patchy soil-vegetative cover, salines, etc.

It is appropriate that ***natural water*** be assessed in the category of "significance", based on the goal function of landscape planning in respect to natural water, which implies an optimal combination of the area's runoff-forming and runoff-regulating potentials for different moisture content regimes of the landscape. Optimality of such a combination is dictated by the need to maintain the ecological equilibrium of biocoenoses and the ecosystems of the streams.

When implemented, this function provides for a natural relationship, for different landscapes, between surface and subsurface runoff or the recovery of such a relationship in disturbed bio-geosystems.

In view of the its drainage condition, the runoff-forming and runoff-regulating potential of the landscape the connections of its water balance with the soil-plant complex through evaporation, transpiration, rainfall detection, etc., and with the terrain through the thickness of the soil-ground layer and the extent of the ways of filtration as far as the draining streams, can ultimately be characterised as the water content of the rivers. As one of the measures for determining the significance of natural water, it is recommended to use the modulus of runoff from an individual landscape at a deep summertime low water period, i.e. when the reserves of soil-ground water are depleted and the ecological situation on the rivers is most aggravated.

It is recommended that the ***climatic conditions*** and ground-level air conditions be assessed in the category of "significance", based on the goal function of climate and air. For instance, this implies tapping the climatic resources (recreational and agro-climatic conditions, and solar and wind energy) provided that the currently existing diversity of climatic conditions persists and that an ecologically safe atmospheric air pollution level is maintained.

It is recommended that the significance of climatic conditions be assessed in an integral manner, based on typifying the climate with due regard for macroclimatic characteristics, mesoclimatic variability of the basic meteorological indices, and landscape diversity. The significance of each of the types of the mesoclimate thus identified is assessed according to the degree of effect of climatic factors on the life activity of people, and to the possibility of exploiting climatic resources.

It is recommended that the following climate assessment criteria be used:

- Favourableness of climatic conditions for human habitation;
- Possibilities for exploiting the recreational potential of the climate for the promotion of various kinds of tourism and rest opportunities;
- Possibilities for exploiting the agro-climatic resources; and
- Possibilities for exploiting alternative sources of energy, such as solar and wind power.

High/moderate 3 – Mountain-taiga native pine and larch-pine, typically with steppe formation; stony, occurring largely on steep slopes near Lake Baikal, favourable for winter survival for red deer and as a habitat of many rare plant and animal species;

Moderate: 4 – Mountain-taiga native light-coniferous larch and pine grass-herbage, dwarf shrub, and shrub, largely on steep hillsides or along waterlogged valleys;

Low: 5 – Mountain-taiga light-coniferous young pine and larch, typically in cutting areas: more rarely, in burnt out areas; 6 – mountain-taiga derivative small-leaved young and uneven-age, with varied cover, typically in cutting or burnt areas, representing major places for concentration of hoofed animals in winter.

High significance complexes of biotopes with high concentration of animals:

I – Mature and overmature Siberian stone pine with pine, aspen and spruce in combination with birch – major place of reproduction of fur-bearing animals, and survival stations for wild hoofed animals during deep-snow winters;

II – Intricate valley complexes of larch-birch biotopes with some spruce, willow, bird cherry, *Vaccinum uliginosum* (great bilberry)< sphagnum and *yernik* thickets, with near-valley pine and larch – places of reproduction for elk, red deer, roe, as well as for upland fowl;

III – Intricate complex of overgrowing cutting areas, hayfields, and *yerniks* with some pine, spruce and larch stands, pine biotopes on interfluves – major places of concentration for elk, red deer and roe during the winter season.

In addition to integral assessments, it is recommended that the significance of bioclimatic conditions (wind-chill factors, normal-equivalent-effective temperature [NEET], climate contrast, etc.) that determine the discomfort of the climate for humans be assessed. In areas of projected utilisation of recreational resources, including climatic resources, an additional assessment should be made of the significance of the recreational-climatic potential.

Assessment of ***landscapes*** in the category of "significance" focuses on determination of the priority utilisation of a particular landscape for recreational purposes: aesthetic attractiveness, optimality for human health, natural comfort, degree of transport accessibility, socio-psychological preference, and interests for various groups of the population, as well as the ecological, cultural, religious-cultural and other value of the landscapes as natural sites for potential uses.

The basic goal function for landscapes involves exploiting recreational resources, focusing on ecological forms of recreation and on improving the socio-economic status of the area. The following may serve as assessment criteria for the significance of landscapes:

- Diversity and peculiarity, expressed in terms of number of different types of landscape, or their morphological links within a definite area;
- Contrast, determined by combinations of heterogeneous landscapes, and by the degree of landscape fragmentation;
- The aesthetic attractiveness that makes it possible to identify landscapes with a particular phenomenon and with maximum distinctiveness;
- The uniqueness that takes into account the distribution of rare and relict landscapes, as well as of natural monuments of educational and scientific value; and
- Possibilities for health improvement, gathering of berries, mushrooms, etc.,

Thus, landscape assessment focuses on distinctive landscape features and diversity, which may represent distinct regional types (East-Siberian, South-Siberian, Mongolian-Daurian, etc.), and show that natural conditions combine to form different regional-typological complexes. Diversity is produced by the variety of types of spatial structure inherent in each landscape complex, and shows up in the properties of its subsystems, i.e. its morphological constituents (facies, stows), as well as via various component-to-component links of individual landscape elements (for instance, intrusion of dark-coniferous taiga elements into deciduous forest complexes, the presence of sub-alpine species in the Siberian-stone/elfin wood/bold piedmont thickets, etc.).

Sensitivity of Biotopes

The category ***"sensitivity"*** is used in reference to the ability of a given natural component to change its properties and dynamic characteristics under the pressure of human economic activity. It is recommended that sensitivity assessment criteria also be selected according to the priority goal function of utilisation.

It is recommended that the sensitivity of ***biotopes,*** depending on the actual state of the habitat of biocoenoses, be determined based on the possible consequences of impacts. These might include forest fires, lumbering, grazing, summer livestock-holding and free-range animal husbandry, input of aerosols, etc. Biotopes are assessed according to their degree of sensitivity to forest fires, based on species indices. For forests, these include stratification, crown density, tree height, presence or absence of thick young understorey and undergrowth, the character of herbage, presence of rare species, the form of vegetation distribution, presence of obstacles, etc.

It is recommended that high sensitivity biotopes incorporate:

- Biotopes in which some of the species composition of the biocoenoses can be irrevocably lost because of large gaps between ranges of population;
- Biotopes in which certain life forms could disappear for a long time for lack of adequate conditions for resettlement, or because of the destruction of colonisation agents; and
- Biotopes in which the quality and reserves of grass consumed attracts gregarious animals, which increases the risk of overgrazing.

It is recommended that moderate sensitivity biotopes incorporate biotopes, where:

- The composition and structure of biocoenoses is recovered through migrants or the input of seeds (germs) from outside; and
- The soil environment is conserved or changed in the wake of the recovery-age succession of biocoenoses.

It is recommended that low sensitivity biotopes incorporate those in which conditions for forest fires are unfavourable, while other impacts (pasturing, agricultural activities, etc.) are of a minor nature.

As an example, Fig. 20 shows a portion of the map of sensitivity of forest biotopes in the Golustnaya river basin to the onset and spread of forest fires.

The sensitivity of ***soils*** is normally determined by the potential of water and wind erosion development under the impact of various anthropogenic stresses. These processes are a result of improper use of agricultural technology or of such technology which damages the soil. For non-agricultural and forest lands, soil cover can be disturbed through excessive recreational use, forest fires, deforestation, overgrazing, etc. It is recommended that the main sensitivity criterion for soil be the degree of impact from current natural exogenous soil-destructive processes.

The degree of sensitivity of soils is usually defined according to three quality categories:

- A ***high degree*** of sensitivity is established if the exogenous processes are fully able to destroy the natural soil structure or the soil itself (i.e., due to landslides, collapsing, aeolian and slope water-erosion processes, etc.);
- A ***moderate degree*** of sensitivity is established if partial changes in the structure of the soil and its components can occur;
- A ***low degree*** of sensitivity is established if the soil can retain its natural structure and function, fertility, and other properties under the impact of these processes.

It is recommended that the sensitivity of soils in polluted areas be assessed by proven techniques, such as those developed by M.A. Glazovskaya and her colleagues (technogen-

IC), 1981). It is recommended that the sensitivity of soils to changes of the ***hydrological situation*** be determined based on an assessment of the runoff-regulating potential of the area. A separate assessment is then made of the sensitivity of the area on catchment hillsides as well as of the sensitivity of floodplain-valley complexes.

The sensitivity of the area on catchment hillsides is regarded as a potential for the processes for the replenishment of dynamic moisture reserves and for drainage basin-induced regulation of the yield of water, which ensures river flow during low water periods. Areas with high regulation ability have low sensitivity.

Such management of natural conditions takes place at definite combinations of water-retention capacity in the upper soil/ ground layer and permeability (seepage) of the underlying materials, and depends on their particle-size distribution. Water yield is determined here by terrain gradients that act to change the soil-groundwater flow rate.

In estimating the sensitivity of surface and groundwater, it is recommended that existing knowledge of the processes occurring in different soil complexes that govern changes of the seepage regime of the catchment basin surface and the degree of regulation of the yield of water from the zone of free water exchange be used. This procedure can draw on information regarding the permeability of soils and rock, within which the seepage flow is produced (Table 3).

Table 3. Sensitivity of the free water exchange zone to a change of the flow-regulation function of landscapes (H – low, C – moderate, B – high)

Water-physical characteristic of soils		Gradient of slopes, degrees			Characteristic of underlying rock	
		< 6	6-15	> 15		
Moisture-retaining capacity of soils and flow rate of soil reserves of moisture	low	**H**	**H**	**H**	poor	Water permeability of underlying earth materials
		C	**C**	**H**	good	
	moderate	**C**	**C**	**C**	poor	
		H	**C**	**C**	good	
	high	**B**	**B**	**B**	poor	
		B	**B**	**B**	good	

The sensitivity of floodplain-valley complexes is estimated in terms of the development of the channel process, which is a key to their formation. The main physiognomic and genetic criterion for assessing the sensitivity of floodplain-valley complexes is the predominant type of channel process in a particular area, determined by the following indices:

- The intensity and trend of channel deformations;
- The transport features of loads and of their balance;
- The conditions of underflooding and flooding of the valley floor;
- The rate of water exchange; and
- The degree of reversibility of the changes in the channel process once anthropogenic stresses are removed.

Development of the stream channel associated with changes in the water regime is a reliable indicator of eventual environmental changes, in terms of both the natural and anthropogenic dynamics (Table 4).

In greater detail, the possibilities and rules for implementation of landscape planning tools in water resources management are outlined in the relevant section.

Table 4. Sensitivity of hydro-morphological characteristics of floodplain-valley complexes to changes of the hydrological regime

Sensitivity	Type of channel process	Hydromorphological characteristics			
		Water exchange rate	Under-flooding, flooding	Transport of loads	Channel deformations
High	Floodplain multi-branching with elements of incomplete meandering	low	maximum in the current and mature belts of meandering	drastic difference in transport ability for different phases of water content	intense plan-height erosion, bank caving, floodplain scour
Moderate	Collateral type against free meandering	moderate	within the current belt of meandering	conservation of the balance of material over the area	Erosion-accumulative process with predominance of plan deformations
Low	Limited meandering against induced meandering	high	no floodplain, flooding within native banks	removal of material over the area	deep erosion, undercutting of banks during freshets

It is recommended that the sensitivity of the ***atmosphere*** to pollution be assessed using the natural self-cleansing ability of the air.

An integrated characteristic of the natural self-cleaning capacity of the lower layers of the atmosphere that accounts for spatial variability of meteorological parameters caused by local climate-forming conditions and the associated patterns of accumulation, dispersal and removal of pollutants, is the climatic potential responsible for air quality formation in the air ground level, estimated using the following criteria:

- Annual air temperature amplitude;
- Annual mean wind velocity;
- Occurrence of calms per year;
- Annual precipitation;
- Number of days per year with 80% or higher relative humidity.

The potential values can be calculated on an ordinal scale using the estimation scale specifically designed for each of the criteria, according to the particular atmospheric circulation patterns over the planning area.

Atmospheric sensitivity to pollutants is inversely proportional to self-cleansing potential: the higher the potential, the lower the atmospheric air sensitivity to pollution, and vice versa. It is recommended that, when used for engineering and recreational purposes, the sensitivity of ***landscapes*** be estimated in terms of the possible origin and intensification of exogenous relief-forming processes resulting from anthropogenic activity.

Estimating the sensitivity of landscapes takes into account the characteristics of the response of their morpho-lithogenic framework (the rate and reversibility of changes) to anthropogenic impacts. Accordingly, the following landscape stability categories can be identified:

- Stable landscapes – Safe or favourable surfaces, on which the activity of exogenous processes are of a minor nature; suitable for intensive utilisation;
- Relatively stable landscapes – Surfaces on which the intensity of exogenous processes is of little significance; suitable for extensive utilisation, provided the soil and surface cover is preserved;

- Relatively unstable landscapes – Potentially hazardous surfaces, with potential for extensive utilisation, but in need of protection against adverse impacts from exogenous processes;
- Unstable landscapes – Hazardous surfaces; utilisation can lead to irreversible processes of landscape degradation; and
- Extremely unstable landscapes – Highly hazardous surfaces; utilisation is undesirable; the spontaneous-destructive character of exogenous relief-forming processes here may jeopardise economic activities and human life.

Table 5 shows a classification of landscape sensitivity to anthropogenic impacts.

In some cases where the particular impact is relatively well known, as in the case of recreational loads, the identification of the sensitivity of landscapes should be handled flexibly, so that changes caused by disturbances can be determined with due regard for the modification of the functional structure of the landscapes.

Table 5. Sensitivity of landscapes to anthropogenic impacts

Degree of sensitivity	Stability	Response characteristics of the morpho-lithogenic framework to anthropogenic impacts of the landscape
High	Unstable and extremely unstable	Initiation or intensification of: collapses, landslides and screes on very steep undercut hillsides, rocky slopes of tectonic contacts and abrasion bluff slopes; landslides and erosion on steep decerption slopes of valleys; erosion on continuous cutting and burnt out areas; erosion-accumulative activity on low floodplain and bank scour; and permafrost processes on the bottom of valley heads
Moderate	Relatively unstable and relatively stable	Origination and intensification of: erosion scour and slow mass dislocations on valley slopes; and deflation on steppe portion of deltas, debris cones and ploughed areas
Low	Stable	Little or no intensification (level surfaces, weakly inclined slopes and terraces)

Sectoral Goals of Land Use

The final outcome of this stage is a package of sectoral maps, with zoning of the area according to the types of utilisation goals. Three basic types of goals are used:

- Conservation,
- Development, and
- Improvement.

The first type of goal – ***conservation*** – is the preservation of the existing state of the natural environment, which is only possible in areas which are either unused or extensively used. The following types of action and measures correspond to this goal:

- Preservation of "non-utilisation";
- Preservation of extensive utilisation;
- Abandonment of intensive utilisation, and its transformation to extensive forms; and
- A ban on any current or future utilisation, or attempts to do so.

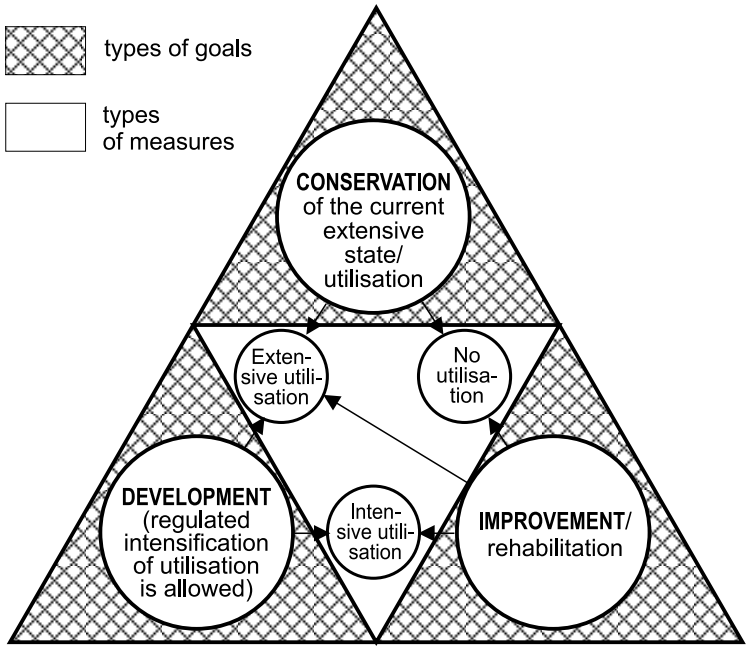
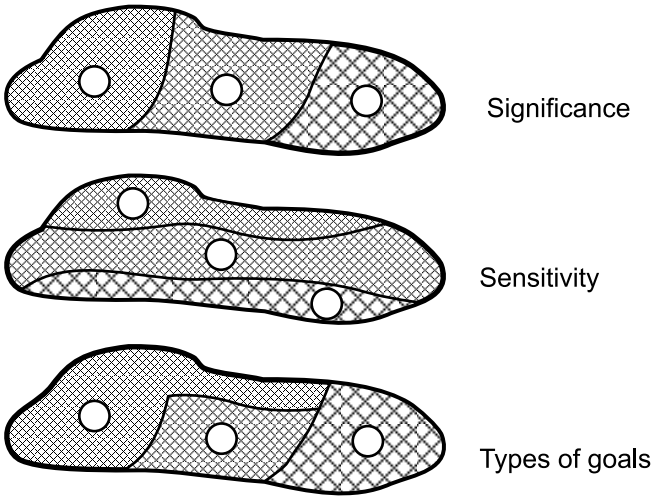


Fig. 21. Schematic representation of the relationship between the types of goals and the types of measures.



		Significance		
		High	Moderate	Low
Sensitivity	High (B)	(C) Conservationa-bandonment of utilisation	(C) Conserva-tionabandonment of utilisation	(I) Improvement-conservation
	Moderate (C)	(C) Conservationexten-sive utilisation	(D) Developmentexten-sive utilisation	(I) Improvementde-velopment
	Low (L)	(C) Conservationexten-sive utilisation	(D) Intensive utilisation	(I) Improvementde-velopment

Fig. 22. Integrating the assessment categories (maps of significance and sensitivity) into sectoral types of goals.

The second type of goal – ***development*** – refers to the development of the area. Here, the law permits both extensive and intensive utilisation. Implementation of the goal of land use according to the "development" type either leaves the protection category (environmental conservancy status) as is, or lowers it one step. This goal permits the following types of measures:

- Preservation of the existing extensive utilisation;
- Preservation of the existing intensive utilisation, provided assessment and regulation is in place;
- Assignment of unused areas to the category of extensive utilisation; and
- Assignment of unused or under-used areas to the category of intensive utilisation (regulated intensification of development).

The third type of goal – ***improvement*** – envisions only a package of measures of land improvement. This applies to areas that have been or are still subject to intensive utilisation.

It should be noted that if any of these types of goals is applied to an area of relatively large size in a 1:200,000 landscape plan, this assignment should be seen merely as the preferred category for this area, and does not rule out any other type of utilisation there. A general overview of the types of goals and measures is shown in Fig. 21.

The type of sectoral goals of development is determined based on maps of values and sensitivity. Typically, the analysis is based on two indices. Zoning of the area under this type of goal is carried out according to the following principles (Fig. 22).

- The "conservation" goal is adopted where the area has the highest significance and higher sensitivity.
- The "improvement" goal is adopted for areas of low significance. Additionally, a map of the actual utilisation and transformation of the area is used, and if such transformation is responsible for its reduction of significance, the area is included in the "improvement" zone.
- The "development" goal is adopted for the remaining area, with special emphasis on stability assessment as a sensitivity criterion. In case of low stability, the area is not assigned to this category.

Fig. 23 shows the sectoral map for the spatial development goal concept for species and biotopes.

The Integral Goal-Oriented Concept of Land Use

It is recommended that the integral concept of land use, or management be developed, based on an analysis of socio-economic problems, including maps of actual utilisation and anthropogenic transformation, resource assessments of the area, and formulation of the goals regarding the use of particular natural components.

This conceptual map is developed in order to:

– identify the territories recommended for natural environment conservation and socio-economic development;

– define the territories facing the most challenging ecological problems requiring special measures for rehabilitation, and the planning of such measures; and to

– specify the priority directions of spatial development as well as to identify the groundwork for such development.

When integrated, the aforementioned three basic components of the conceptual map provide a means to distinguish at the spatial level between ecological and socio-economic problems, each within its own designated area, so that the direction of action to optimise activity in each of area can be defined.

This distinction is to be accomplished by comparing the goals of utilisation for each natural component: biotopes, soil, surface and groundwater, landscapes, climate, etc., which together provide insight into the functional significance of the area.

It is recommended that the natural complexes that provide an environment-shaping framework for the area, or are carriers of its unique and aesthetically especially valuable properties, be removed from utilisation and combined into a single area designated as primarily largely for conservation. The existence of such an area guarantees the maintenance of the natural environment-shaping landscape functions of the area as a whole, the reproduction of natural resources and, ultimately, the preservation of the uniqueness and natural diversity of the landscape. For especially valuable landscapes, it is envisioned that utilisation be abandoned, and a regime like that of the nature reserves (protected areas) be set up.

Natural complexes with high environmental-protective potential constitute the area on which most existing and planned utilisation takes place. Nature management in such areas is carried out pursuant to existing legislation.

It is recommended that all natural complexes disturbed by utilisation be combined into a single area, with the goal of rehabilitation. The recovery process period and the technology could differ according to the character and degree of transformation. It is also recommended that assessment be made of the capacity of the disturbed landscapes to self-recovery once anthropogenic stresses are removed. It should then suffice to abandon utilisation for a certain period. For areas threatened by irreversible change, or for landscapes with a low capacity for self-recovery, it is recommended that special additional measures be taken. Once they have recovered, the natural complexes of these areas could be attached either to the conservation area or to the development area, thus enhancing the potential for spatial development.

It is advisable to develop an integral concept of goals on the basis of maps of sectoral goals. Wherever the areas of sectoral goals, when applied to a single map, do not coincide, integration is to be carried out on the priority principle.

Fig. 24 shows the technique for compiling maps for integral development goals.

The integral goals map (Fig. 25) is supplemented by an additional text with the description of the general concept of further spatial development, which may contain:

– The basic characteristics of the nature conservation policy;

– Major types of planned activity;

– Means of combining nature conservation and economic activity; and

– A list of basic frameworks for guaranteeing the implementation of the selected direction of development.

The Priority Areas of Action and Measures

The major types of action and measures are suggested based on the goals of utilisation and development of a particular area, and on the recommended relationships between them. Zoning of the area is accomplished via the integral goals map, according to the types of action and measures.

For the planning area, the following types of action and measures may be envisioned:

– Measures common to all areas, for the implementation of a concept, and for its development; these can include elaborating general legal rules, or focus on the implementation of a landscape plan, or involve proposals for upgrading and maintaining the functional framework of land management, or include various types of activity affecting the area as a whole;

– Measures for the preservation of the existing status or utilisation of separate areas of the planning area (the targeted "conservation" area with and without separate types of utilisation);

– Measures for the further development of the existing or prospective utilisation (targeted areas of existing and planned utilisation);

restoration of the natural potential of derivative biotopes; forest and shrub, often waterlogged, valley biotopes that serve as feeding stations for animals as well as providing necessary protective conditions for many plant and animal species; high significance meadow and swamp biotopes within the delta, with very favourable conditions as nesting sites for rare birds; and high significance mountain-taiga Siberian stone pine biotopes within the pine cone harvesting area;

***Primarily* further development of existing and planned utilisation**:

3 – Extensive development. High and moderate significance biotopes of valley meadows, as well as of "island" steppes within the delta; moderate significance pine biotopes, predominantly on steep hillsides;

4 – *Intensive development (regulated intensification of utilisation is permitted*). Intricate complexes of forest shrub, meadow biotopes with overgrown cutting areas, with high seasonal concentrations of valuable game animals; and biotopes near human settlements.

***Primarily* improvement / rehabilitation**:

5 – *Improvement followed by assignment to the category of extensive utilisation.* Light-coniferous and small-leaved stands of moderate and low significance, biotopes of the upland belt, with undergrowth of valuable species. Siberian stone pine (potential Siberian stone pine stands); biotopes of the Lake Baikal shore area, with rare plant and animal species concentrations;

6 – *Improvement followed by assignment to the category of extensive utilisation.* Small-leaved and light-coniferous young biotopes of the low-mountain belt, largely of low significance, littered as a result of cutting operations, forest fires, and windfalls; biotopes of recreational areas, and freshly burnt out areas.

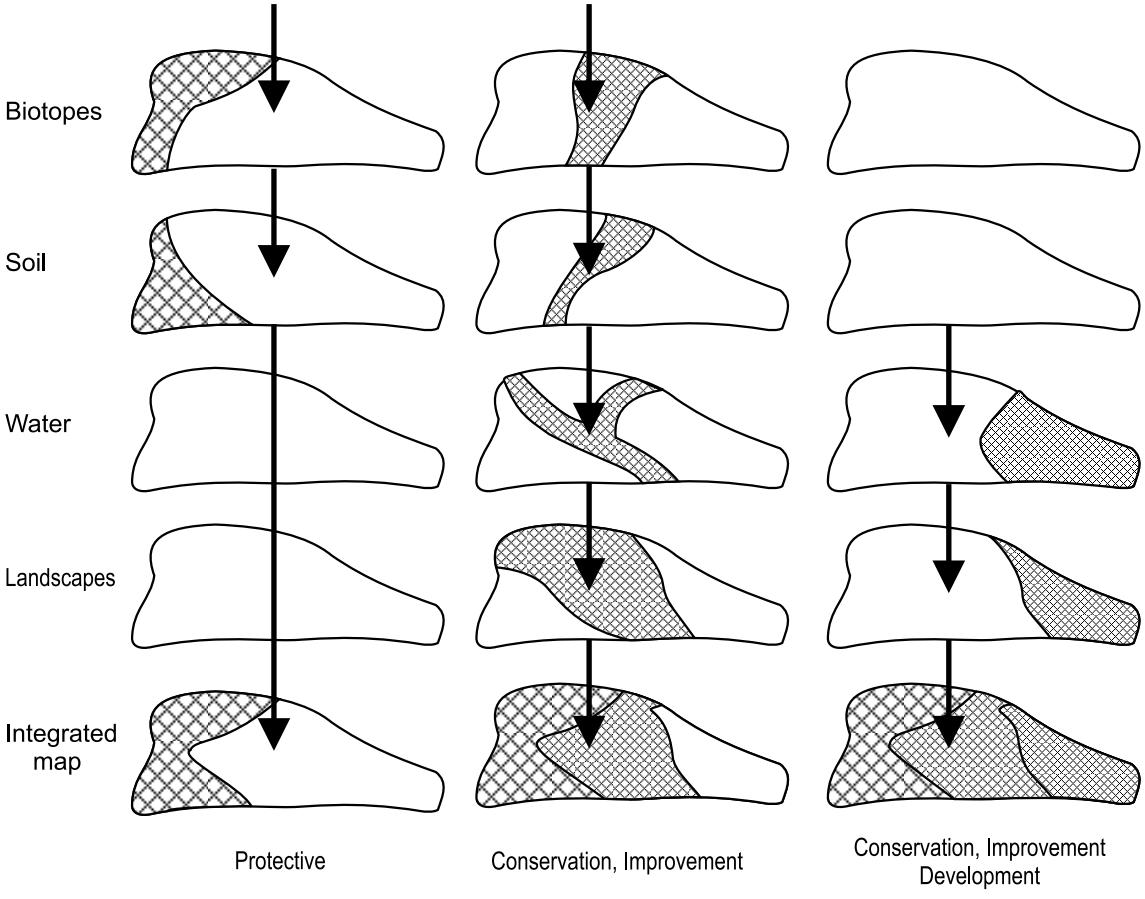


Fig. 24. Technique for compiling maps for integral development goals.

– Measures for improvement of the activity for conservation purposes;

– Measures for improvement of the activity for development purposes; and

– Major actions for improvement of the social sphere.

The description of particular measures is preceded by an outline of the actions common to the entire territory, which comply with the development concept for that territory (legislative initiatives, major features of the management structure for a given area, monitoring of the efficacy of the planned measures, and support for them, etc.).

It is advisable to describe the individual types of action in conformity with the sectoral make-up of the economy and land use (for instance, separately for agriculture, forestry, tourism, the social sphere, etc.), by maintaining an identical level of scale and detail in working out the measures.

Prerequisites and Framework Conditions for Forthcoming Planning

The main condition for ensuring the objectivity and efficiency of the outcome of subsequent landscape planning at whichever scale is the continuity of the planning methodology. It is therefore recommended that some time after the completion of planning, the final section of the landscape plan define the framework conditions for the renewed elaboration of the plan at the same scale, or for the drafting of a new plan at a larger scale. These conditions should describe the main prerequisites, current necessity, and prime objectives of the new plan.

Fully or partially renewed landscape planning may be required in the following cases:

– Updating the entire concept of spatial development where

– new legislative and normative acts will conflict with the concept of spatial development adopted, which is part of the existing landscape plan; and

– the concept of spatial development is inconsistent with actual changes, primarily in the socio-economic sphere, or where the prime objectives of development have already been achieved.

– *Identification*of new, high priority components the preservation of which could contribute to achieving the prime objectives of spatial development.

– *Revision*of the boundaries of specific zones where, for instance,

– positive changes have occurred in the status of certain natural components, and a reduction of the improvement area is possible;

– the forage reserves for livestock are such that husbandry and its further extensive development are unprofitable; and

– agriculture fails to meet the requirements of the local population and tourists for food products that have been traditionally manufactured in the area.

–*Revision*of the concept of development mandatory where

– new normative restrictions have been imposed on nature management and environmental impact assessment; and

– aggravation of problems related to the character of regulated nature management has occurred.

– *Updating or adjustment*of the directions of action and measures where

– nature conservation recommendation for individual natural components are not adhered to, or do not serve the goal concepts of development; and

– natural recovery of disturbed natural complexes is insufficient, or has an undesirable trend.

Renewed planning is sensible and will yield new results only if all goals of the previous plan which define the priority areas of spatial development have been achieved.

4 – Moderate significance, high and moderate sensitivity floodplain-valley complexes. Flow regulation and quality formation. Protection of surface water and valuable floodplain-valley complexes, including cryogenic complexes.

Primarily Further Development of Existing and Planned Utilisation:

E*xtensive development:*

5 – Moderate and low significance, low sensitivity, grass forests in the lower part of the slopes. High environmental-protective potential. Seasonal flow regulation;

6 – Moderate significance, low sensitivity, floodplain-valley complexes partly transformed by economic activity. High environment-protective potential. Regulation of the rate of erosion processes, primarily river-bed processes.

Primarily Improvement (Rehabilitation):

Improvement followed by assignment to the category preservation of extensive utilisation:

7 – Low significance, differing degrees of sensitivity, secondary forests in clear-cut and burnt out areas in the lower and middle parts of the slopes. River valleys disturbed due to logging. High environment-shaping potential. Potential for natural recovery. Enhancement reserve for the environment-shaping framework of the area through an expansion of the buffer zone;

Improvement followed by assignment to extensive development category:

8 – Same as above. Moderate and low environment-shaping potential. Possibility of natural recovery, or of restoration via compensation measures. Reserve for an expansion of the development zone.

Further Possibilities for Use:

1, 2 – *No economic activity permitted.* Protected parts of the area are monitored by multifunctional permanent stations in charge of arranging environmental/ scientific research and educational-recreational types of activity;

3, 4 – *Existing types of extensive utilisation to continue*. The area is monitored by multifunctional cordons. Collateral forest utilisation (hunting, gathering of wild-growing fruits), and numerous groups of vacationers are permitted;

5, 6 – *Extensive utilisation to continue.* The nature management is developed in individual projects. Agricultural and forestry activities are supervised by the forestry agency. Guarantee of open, environmentally clean lands around residential centres. Top priority reserved for spatial development;

7 – *No utilisation permitted for the recovery stage.* After improvement, the area is to be assigned to the zone in which sustained extensive utilisation continues. Potential reserve for collateral forest utilisation;

8 – *No utilisation permitted for the recovery stage*. Upon improvement, the area is attached to the extensive development zone. Reserve for socio-economic development of the area, including forms of recreation for small numbers of vacationers (holiday camps and recreation centres, new farms, dachas).

5.5. LANDSCAPE PLAN (1:25,000)

General

It is normally recommended that a landscape plan be drafted for territories under local self-government, or for a portion of a municipal district; yet it can also be projected for areas of high natural significance (a sanctuary, a nature reserve, a game reserve, or an area within a national or natural park).

Unlike a medium-scale landscape plan – i.e., a landscape master plan – the goals of landscape planning typically address not the general problems of spatial development but particular priority problems defined within the context of environmental requirements by structural policies of higher-level plans.

It is normally recommended that the boundaries of territories be used as the boundaries of the landscape planning areas. This does not rule out the possibility of focusing on the natural, historic or other boundaries, if the prime objective of planning can be most effectively achieved within such boundaries. In this case, however, it would be appropriate to take into account all links of the unified, established, economic complex involving the infrastructure (roads, and other service lines), the social sphere, production and processing of raw materials, and the recreation and wildlife conservation zones. Once the prime objective is defined, it will be possible to clearly identify the boundaries of the area to be analysed. This can also be done in the course of defining lower-level goals.

Once the boundaries of the planning area are defined, it is appropriate to identify the particular problems related to the area being analysed, and to construct a so-called goal chart to address the problems involved. Their hierarchy is established in the course of analysing the ecological, social, political and economic conditions of development.

Thus, with regards to specially protected territories, ecological problems are considered first. These are then resolved not only via environmental measures but also via economic and other action. For agricultural areas, it is appropriate to apply the principles of sustainable development to counteract the overload on the landscape and to provide long-term utilisation and reproduction of natural potentials. Moreover, ecological factors are not necessarily decisive; however, they can help in structuring the decision-making process.

An important aspect of the landscape plan consists of coherent analysis of political, social, economic, and ecological problems, for the purpose of addressing the development of a particular area subject to structural planning, via analysis by means of the goal chart. Each of the above spheres is broken down i into specific elements. Thus, the economic sphere is subdivided into the processing industry, forestry and water economy, transportation, power generation, and commerce (Fig. 26).

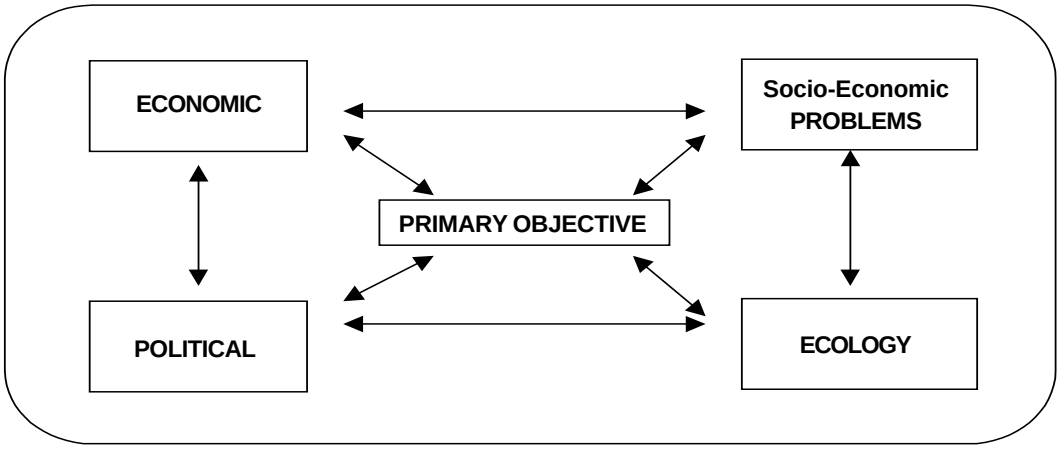


Fig. 26. Integrated problem definition for the landscape plan.

For each of the components, all possible problems are considered, a particular chart of goals is generated, and the dominant, particular overarching goal is established. For instance, as regards agriculture, this can involve such problems as weak anti-erosion properties of the soil or weak water-protective capacity, absence of sources of firewood or building materials, etc. A particular goal of forestry may be the rehabilitation or enhancement of the environmental-protective properties of the forest. For transportation, the goal would imply creating or improving the transportation network as a basis for the delivery, processing and sales of agricultural produce; for the power sector, it would be the problem of supplying electric power to processing enterprises; and for commerce an effective network for the reception and sales of products, etc.

These goals are all based on such important macroeconomic principles as the availability of the sales market, product cost, investment policies, etc., which are however enhanced to include an ecological perspective.

In the social sphere, it is possible to identify such factors as employment and unemployment, culture, education, pension provision, public health, etc. For each of the components, it is also necessary to consider the range of problems, and to identify the particular overarching goals that determine the priority areas of development.

Within the context of spatial planning, the political sphere, despite its current importance, is the least well elaborated to date. Let it suffice to mention such important factors

as matters of administrative division and government, and the legal foundations for land use which, too, must be examined when projecting landscape planning.

Once the prime objectives and goals of development have been defined for each of the spheres and for their individual components, it is recommended that consideration be given to the information support for the landscape plan. It is also important to keep in mind that planning should be based largely on existing, well-established data.

Natural components of the highest significance are selected to assess the characteristics of natural and ecological conditions within the framework of the landscape plan, and to develop the goals of development. The soil, species, biotopes, landscapes, and their recreational potential are most commonly used for that purpose. All work on projecting a landscape plan can be subdivided into the same five stages as in the case of a structural plan.

The Inventory Stage

As with the landscape master plan, the inventory stage can proceed from governmental statistical data, forest evaluation and land management data, observational series by the hydro-meteorological network, etc., updated in the course of field surveys, and by analysing published data, maps and aerospace observations. The bulk of the information for evaluating soils, species and biotopes is derived from land management data for agricultural areas (soil and geo-botanical 1:25,000 maps), and forest management plans.

In order to assess landscapes and the potential promotion of tourism, it is advisable to carry out an additional survey of recreational sites. Survey areas must be mapped (Fig. 27), drawing on the available cartographic and archival material, and regulatory documents provided by committees for land resources and land use patterns, as well as by individual economic entities. In the course of field surveys, this material must be checked for completeness and objectivity.

The socio-economic situation is examined using population census data, official demographic and social statistical data, interviews with the heads of local authorities, local employees and specialists, and the results of route surveys and interviews.

The categories of lands are determined using mapping and statistical information, regulatory documents and reports on the reconciliation of the land use boundaries for the particular territories from the archives maintained by their land resources and land use agencies, as well as special published map documents.

Thus, the structure of input information and its sources remain largely the same as at the higher level of planning. But all input must be represented by detailed data, with an increased proportion of original data obtained in the course of field surveys.

Assessment Stage

The prime objective of the assessment stage is to appraise the current natural conditions of the area in terms of the “significance” and “sensitivity” categories, as done in the case of structural planning.

It is recommended that the significance of ***soils*** (Fig. 28) be evaluated according to the particular economic utilisation: either in forestry or in agriculture (separately – in crop-growing or for grazing lands and hayfields). In addition to soil maps, assessment efforts draw on land management data (agro-production maps for groups of soils, with recommendations for their use), and forest management plans. High significance soils include rare soils for a given area, soils with a very thick root layer (for forestry), or high agro-productive properties (for agriculture), soils with high humus content, with sufficient nutrient elements, and with near-optimal indices of heat and moisture availability, and soils which allow growth of large phyto-masses, and which have a low degree of erosion. Soils of low significance include common soils with low indices of fertility and forest reproduction suitability, and eroded and foul soils. All other soils should be assigned to the category of moderate significance for a certain use type.

For river valleys and lake shores, it is also necessary to assess the water-protective significance of soils with due regard for their capacity for water-regulation – fluvial flow formation and surface-to-ground water transformation – and sorption – protection of groundwater and river water against technogenic pollution and contamination. The water-regulating capacity of soils is determined by their water retention and seepage properties, and is assessed using D.L. ARMAND'S (1961) classification of soils by water permeability, depending on particle-size structure and the character of their potential structure. Assessment of the sorption capacity of soils is based on an analysis of the properties that govern the processes of transformation, removal and accumulation of substances within the soil mantle, as well as the degree of mobility of toxic compounds – content and composition of organic matter, cation exchange capacity, content of exchange bases, degree of saturation of maximum tolerable concentrations (MTC), content of carbonates, mineralogical composition, etc..

It is recommended that the sensitivity of soils (cf. Fig. 28) be assessed in terms of the degree of expression criteria for current exogenous soil-destroying processes, using land management data (soil erosion maps, maps of categories of land erosion). Areas showing hazardous hydrological processes (such as icing and flooding), identified through special-purpose hydrological surveys, are examined separately.

The significance of ***biotopes*** is assessed by analysing the data at the sites of rare, relict and endemic plant and animal species which affect the structural features of vegetative cover (diversity of life forms, species composition, etc.), as well as the compositional features of animal populations and their dynamics. High significance biotopes may includes biotopes with identical potential and existing environmental conditions (sites of rare, endemic and relict flora and fauna species; rare biotope types, etc.). The group of moderate significance biotopes consists of biotopes the potential environmental conditions of which approach the existing state; biotopes of low significance include those with a drastic difference between potential and current environmental conditions.

When assessing the sensitivity of biotopes it is advisable to place particular emphasis on the effects of forest fires, logging, pasturing, summer livestock holding, and the participation of animals in the colonisation of valuable tree species. Allowance is also made for the composition and structure of vegetation, and the presence of rare species. Some other indices also taken into consideration include: projective cover of the surface with the vegetative mass and its reserves, forms of colonisation of plants via wind, water, or animals, and the presence of such obstacles as stoniness or water content. These criteria are used to identify high, moderate and low sensitivity biotopes: High sensitivity biotopes are those in which some of the species composition of the biocoenoses may be irreparably lost due to large gaps between their habitat areas. Moderate sensitivity biotopes are those of which the biocoenoses can be restored through migration of species, the soil environment remains unaltered, or is changed in the wake of the recovery-age dynamics of biocoenoses. Low sensitivity biotopes are those which lack the necessary conditions for forest fire initiation and spreading, while the effects of pasturing, re-afforestation and agricultural activities are of a minor nature.

Assessment of ***landscapes*** in terms of the "significance" and "sensitivity" categories focuses on determining their general potential prefer utilisation for recreational purposes, based on aesthetic attractiveness and optimality of the natural environment for human health and natural comfort, their degree of transportation accessibility, their socio-psychological preferences and interest groups and their ecological, cultural, religious or other value as natural sites. When assessing the significance of landscapes, the emphasis is on their peculiarity and diversity, uniqueness (the presence of rare or exotic geological formations, plant and animal species, etc.), and attractive landscape features. Assessing landscape sensitivity is based on using information about current states and dynamics of landscapes, and identifying the possible changes in landscapes caused by their disturbance. Landscape sensitivity indicators are also represented by the limits of their recreational carrying capacity, the presence or absence of unorganised recreation, climatic restrictions, and risk factors.

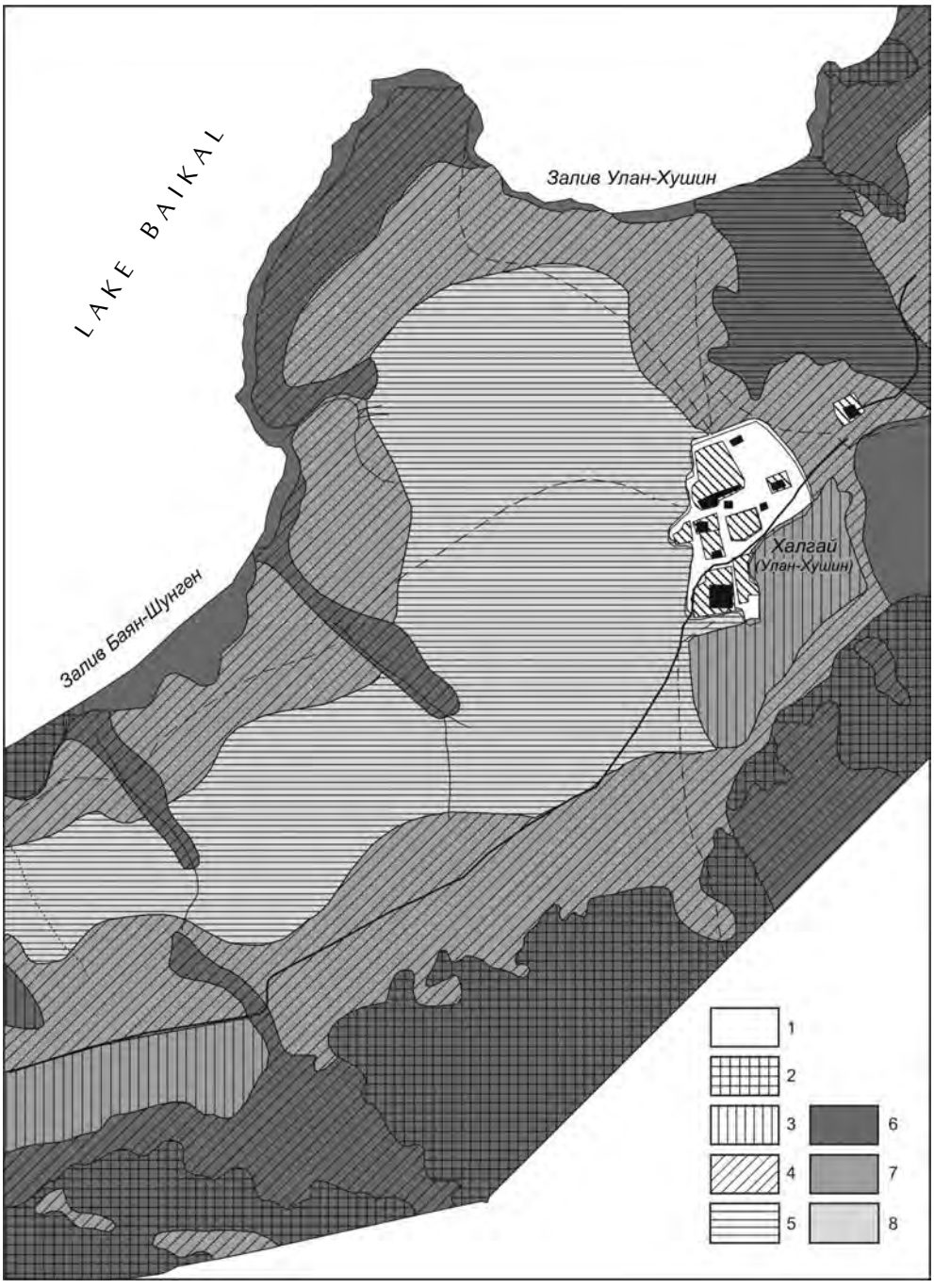


Fig. 28. Natural environment. Soils. Significance and sensitivity.
A portion of the map for the Olkhon district.

Significance for conservation of plant communities
1. High (forest and mountain-steppe patchy and poorly developed sod soils, crag outcroppings, rock-falls and screes, and debris slides)
2. Moderate (forest and mountain-steppe poorly developed and shallow sod soils, rock outcroppings)
Significance for agricultural uses
3. High (chestnut-like medium humic, sometimes meadow-like and meadow-chestnut soils)
4. Moderate (sod forest, sod steppe, chestnut-like and mountain-steppe low-humic meadow-chestnut-like and meadow-gleyed)
5. Low (sod steppe and chestnut-like low-humic eroded, arenic-saline)
Sensitivity of soils to soil-destroying exogenous processes
6. High **7.** Moderate **8.** Low

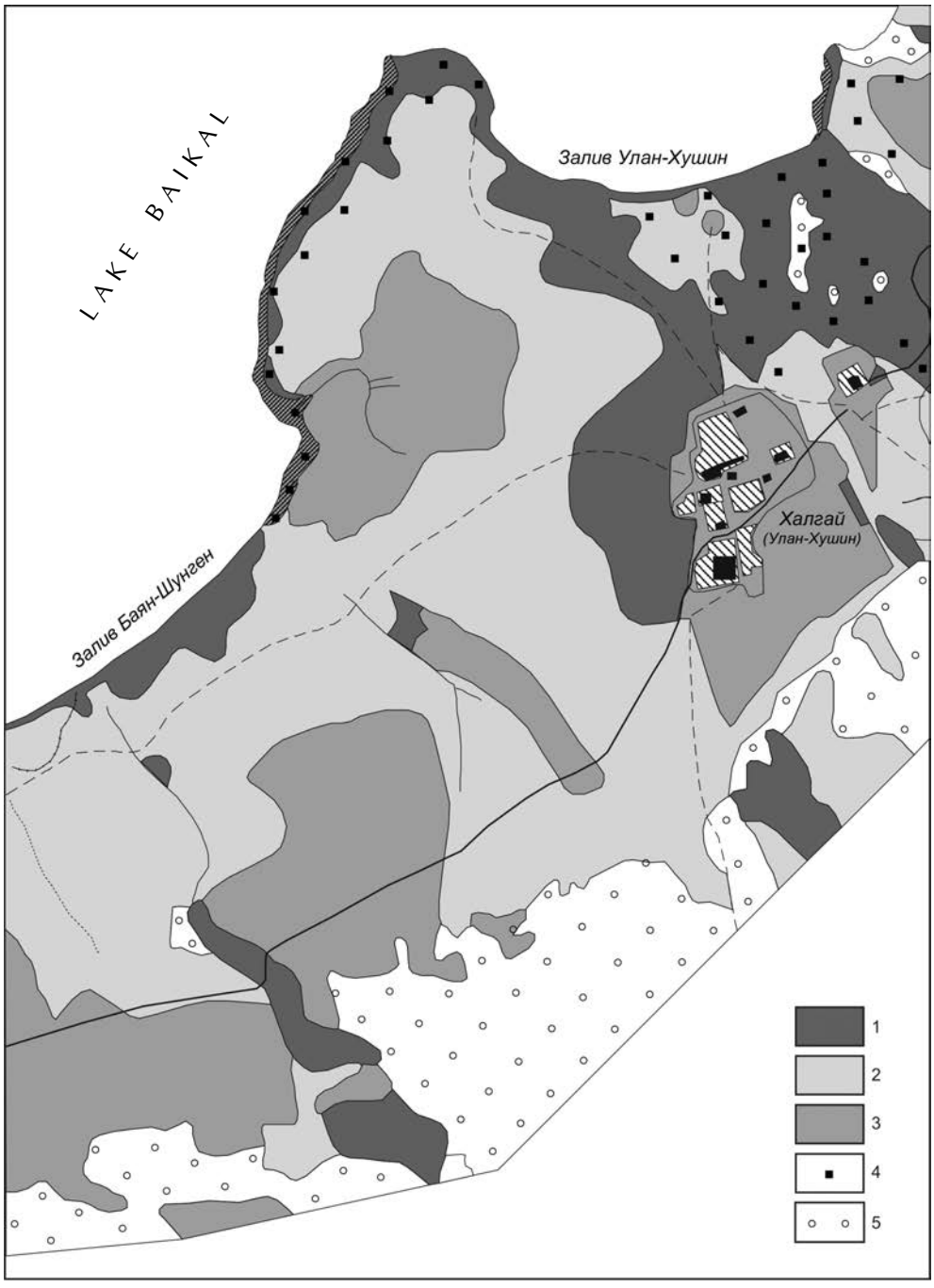


Fig. 29. Natural environment. Species and biotopes. Goals of spatial development. *A portion of the map for the Olkhon district.*

Preservation and Reduction of Herd-Grazing Stresses

1. Mountain-plain dry, very stony steppes, piedmont dry sand steppes (*Festula sulcata, Stipa capillata, Poa bulbosa, Carex, Chamaerodos,* and *Thymus*, with projective cover of the surface with herbage less than 30-40%), typically low productive (as low as 0.15 t/ha of dry consumed phytomass), scarcely suitable for hayfields, with low and moderate quality forage, scarcely suitable for artificial additional sowing of grasses, and for formation of cultivated coenoses, in places with elevated concentration of medicinal herbs and herbs on the Endangered Species List, stenochoric representatives of fauna; agriculturally unsuitable lands (scrags, rockfalls, screes, sands with groups of grass, tree-shrub, and moss-lichen vegetation, with nesting sites of birds, and elevated concentration of stenochoric species of fauna).

Preservation of essential rangelands, with regulated practices and numbers of livestock grazing

2. Largely small and large-grass, weakly stony mountain-plain steppes (*Festula sulcata – Stipa, Stipa-Festula sulcata, Leymus- and Eugropyrum-Stipa* and *Festula sulcata*, with projective cover on the order 30-50%), moderately productive (as much as 0.15-0.25 t/ha of consumed dry phytomass, in places with hayfields), typically with good quality forage, and with a short recovery period of grass in overgrazing areas.

Intensification of utilisation of the former agricultural and remaining near-village lands, setting up of recreational areas with relevant infrastructure

3. Intermontane-riverside meadow steppes, riparian and riverside meadows (leymus, hordeum, and meadow poa, with projective cover of 50-60% or more), moderately and highly productive (0.25 t/ha or more of dry consumed or mowed-down phytomass), with good or moderate quality forage, suitable for additionally sowing forage grasses, and for formation of artificial coenoses in areas with sufficient water supply and on highly humic soils;

Meadowed forests and shrubs with heavy steppe formation, poorly forested and shrubby steppes, meadow-steppes, and meadows; plowing lands, kitchen-gardens, grazing areas for livestock, Village lands, residential and industrial areas, and roads of regional significance.

Additional Provisions

4. Provision for the conservation of zones of top priority surveys of habitats for animal and plant species on the Endangered Species List;

Mountain-riverside unsuitable agricultural lands (petrophyte, hygrophyte, holo-hygrophyte and psammophyte biotopes with groups of pioneer vegetation and the corresponding stenochoric fauna;

Patches of the primitive herbade-grass steppe and sub-taiga;

5. Forests.

Drafting Goal-Oriented Concepts of Development

Goal-oriented concepts of development (Fig. 29) are drafted using the data from the assessment stage, and include the goal-oriented concepts for each natural component, and the integrated goal-oriented concept. There are three types of goal, each with sub-goals:

Conservation

Preservation of the current status and abandonment of separate types of utilisation: For areas with high significance, high sensitivity soils, biotopes or landscapes;

Preservation of the existing extensive utilisation: For areas with moderate and low significance, high sensitivity soils, biotopes, and landscapes.

Development

Extensive development, with local conservation and rehabilitation of disturbed landscapes: For areas with partially disturbed, high and moderate significance, or moderate and low sensitivity soils and biotopes;

Extensive development: For areas with high and moderate significance, low sensitivity soils and biotopes;

Regulated intensive development: For areas with high significance, moderate sensitivity soils and biotopes).

Improvement

To be later assigned to the category of regulated intense development: For areas with disturbed, high significance, moderate and low sensitivity soils and biotopes;

To be later assigned to the category of extensive development: For areas with disturbed, moderate significance, moderate and low sensitivity soils and biotopes;

To be later assigned to the category of regulated extensive utilisation: For areas with disturbed, moderate and low significance, high sensitivity soils and biotopes.

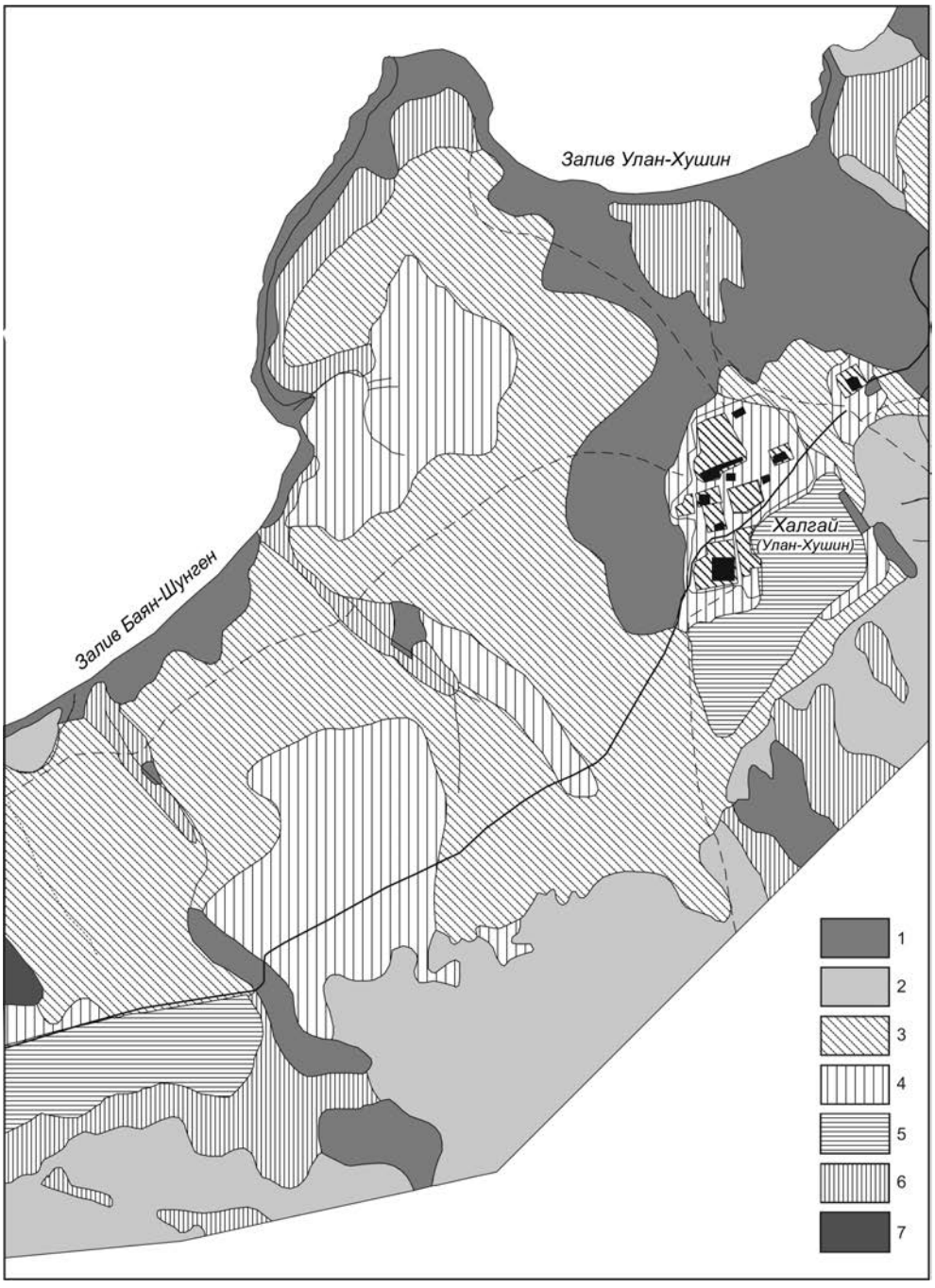


Fig. 30. Integrated goals of spatial development.
A portion of the map for the Olkhon district.

Conservation. **1.** Preservation of the present status by abandonment of some of the minds of utilisation plus reduction of herd-grazing loads. **2.** Preservation of existing extensive utilisation plus top priority survey for habitats of rare and threatened and endangered species.

Development (utilisation).

3. Extensive utilisation as naturally occurring forage lands. **4.** Intensification of utilisation of former agricultural and near-village lands plus (in places) setting up of recreational areas with relevant infrastructure. **5.** Extensive utilisation in crop-growing. **6.** Regulated extensive utilisation as forage lands with local conservation and rehabilitation of disturbed landscapes.

Improvement (rehabilitation).

7. Improvement followed by assignment to the category of regulated extensive utilisation.

It is recommended that, in accordance with the goals identified, the zoning maps for the planning area be reconciled with the goal concepts as elaborated in the phase of medium-scale structural planning and with legally approved patterns of environmental and water-protective zoning, and be adjusted using land management data (maps of measures related to the utilisation and improvement of haylands, rangelands, and prospective rehabilitation lands), and field survey.

The Integral Goal-Oriented Concept of Development

It is recommended that a map for the integral goal-oriented concept of development, similar in content to that for the functional zoning of lands, be generated by combining the goals of utilisation of individual natural components (Fig. 30). In so doing, it is recommended that key factors of goal-oriented spatial orientation, socio-economic problems, and the resource assessment of the area be considered. Should the areas covered by the types of sectoral goals not coincide, the priority principle should be applied to integration: Top priority is assigned to conservation goals, followed by improvement/ rehabilitation), and, finally, those parts of the area which have not been assigned to the first two categories should be are assigned to development. By defining the integral goals of development, it is possible to distinguish between the areas recommended for environmental conservation or socio-economic development, to delineate areas facing the most challenging ecological problems, and to envisage relevant remedies as well as assigning priorities of spatial development, and specifying the basic patterns for such development.

Definition of Action and Measures

Once formulated, the goals of spatial development are achieved through a package of definite action and measures; to accomplish this, it is recommended that the territories be differentiated by type of measure, based on an integrated map of goals (Fig. 31). Unlike a similar medium-scale map, this map shows not only the types of measures, but also terrain-specific measures with reference to applicable legislation, drawing upon the data on the socio-economic conditions of the population. The following measures can be defined:

– Measures common to the entire planning area, and focused on implementing the development concept;

– Measures for the preservation of present status of land use;

– Measures for the further development of existing and planned utilisation;

– Measures to improve the state of natural components; and

– Measures for the further development of the socio-economic environment in residential areas.

The above figures show portions of certain maps from the series of 1:25,000 landscape plans developed for model plots in Prebaikalia under the Russo-German landscape planning project. They illustrate the implementation of the above principles and practices employed in generating landscape plans, as well as visualising their concrete contents.

As pointed out above, unlike landscape master plans, which have a rather universal character, landscape plans can differ substantially in content and size, as can readily be seen by comparing the above map segments. On the other hand, these maps, notably the structures of their comprehensive legends, could be recommended as models for reasonably widespread use.

6. LANDSCAPE PLANNING PROCEDURES

This chapter addresses some legal aspects related to the implementation of landscape and integrated planning in Germany, and the new developments for one of Russia's regions, the Irkutsk region. Background experience is summarised with regard to the organisation and implementation of planning in the Baikal region.

The sixteen German states each have their own land use planning systems, since the federal government only has framework competence in the sphere of spatial planning and nature conservation. However, the diversity of legal structures does not rule out certain features inherent in land use planning common to different states. Plans can apply to the area of the whole state, to a region or a district within a state, or to a community.

Integrated planning covers developed and undeveloped areas, and links the objective of nature conservation with the socio-economic interests of land use. Sectoral plans normally encompass strictly determined parts of an area, and describe and assess them only from a specific, not integrated, standpoint. In this context, landscape planning may also apply. Usually, it extends to non-developed areas.

Both in system of integrated plans and that of sectoral plans are hierarchical: the lower-level plan is generated from the higher-level plan, and the provisions of the latter must be adhered to in the former. On the other hand, in a higher-level plan, allowance should be made for the specific interests that are to be reflected in the lower-level plan, even if they are not yet embedded in the latter (so-called direct-coupling: the feedback principle).

Under the German planning system, there are two approaches by which landscape plans are "fitted" into the integrated plan, known as primary and secondary integration. Secondary integration signifies that the landscape plan has the status of an independent plan. Primary integration means that the landscape planning process is a part of an integrated planning process.

For integrated planning, the "equilibrium" usually applies. Sectoral plans, by contrast, aim to protect of certain special interests. The goal of landscape planning is nature conservation and landscape maintenance.

Land planning, usually undergoes four stages: project development, project discussion, project completion, with due regard for the result of the discussions, and decision-making. Moreover, it is customary to distinguish between the "internal" (managerial activity-related) and the "external" (citizen-related) legal mandate, or the binding quality of the plan. Landscape plans are only "internally mandatory".

In one section below, a concept is suggested for a regional law on planning of spatial development for the Irkutsk region. "Planning of spatial development" in this case means the definition of plans for priorities and prospects of land use to ensure its sustainable development. It is suggested that the law define the general principles of planning, the requirements to be applied to plans, the types of spatial plans and their interrelationship, the mechanisms for preparing, discussing and adopting them, and their legal status.

Overall, all comprehensive spatial development plans can be classed in two groups: (1) regional or district spatial development plans (higher-level plans); and (2) local plans (lower-level plans). Local plans also include planning for residential areas, and the land between these areas, and refer to their respective regional and district plans.

This section gives an insight into the division of responsibility for the development and approval of plans; the role of zoning; the content of plans; the interrelationship between plans, projects, and programmes; the procedures for preparing plans; the involvement of the public; and the legal status of spatial development plans.

A large section is devoted to the administration of landscape planning. In the first stage it is necessary to define the principles and procedure of selecting model areas. The rationale for selection of such areas is provided by the following criteria: representative quality, availability of information, support from authorities and the public, and the potential for implementation. As a result, the objects of planning came to be represented by areas varying in spatial level and functional purpose, ranging from the entire Baikal Natural Territory to small model springs.

This organisational experience is illustrated with the example of efforts in the Baikal region. A key role was played by the favourable local prerequisites for the implementation of such efforts, as well as by the presence of interdisciplinary integration within a rather large group of specialists endowed with background experience of complex spatial analysis and with the necessary information at hand.

Active involvement of public organisations and local residents is one of the chief guarantees for the success of the goals of landscape planning. The section gives some recommendations for enhancing the participatory character of the planning process.

6.1. VARIANTS OF LEGAL SUPPORT OF LANDSCAPE PLANNING

Some Special Features of Land Use Planning in Germany[1]

General

Under German law, the term "landscape planning" is a narrower concept, while "land use planning" is a more generalised concept, encompassing a wide variety of plans. Ecologically oriented land use planning refers to a set of "plans" that are understood in dynamic terms (with an eye to the process of elaborating plans), and in terms of their structural stability (the "plan" or "programme" as a product, with text and maps).

Plans may cover an entire state, a region or district within a state, or a local community. The smaller the planning territory, the larger the scale of the plan will be. The planning area corresponds to the level at which the planning decision is to be taken: for Germany as a whole, the federal government is the decision-maker; within a state, it is the state government; within a region or district, it is that entity; and within a local community, it is the municipal administration.

Integrated Planning

Integrated planning encompasses undeveloped and built-up areas, and combines the nature conservancy mission with the socio-economic interests of land use. In most cases this planning is referred to as spatial planning. The plans are termed spatial plans (literal Russian term: Territorial Programme); and, at the lower (community) level, land use plans. In areas used for construction, they are called building plans.

Sectoral Planning

Typically, sectoral plans encompass strictly delineated parts of a territory, and describe and assess them from a definite, non-integrated perspective. Planning of this type includes, e.g., planning of transportation routes, waste collection and disposal, and water facilities. In this context, landscape planning is also of relevance. Usually, it applies for undeveloped territories (in some states, however, it also applies to developed areas), and describes and assesses land use from the nature conservation perspective. These plans are called, respectively, landscape programmes (state level), landscape master plans (regional level), and landscape plans (community level).

The Land Use Planning System

An examination of the aforementioned characteristics of the various types of plans furnishes an opportunity to compile a chart of land use plans in Germany (see Table 1). This chart reflects the established legal system. Actually, only integrated plans are in general use (except for building schemes which are, obviously, drafted only for construction-zoned land). However, there are significant gaps in landscape planning.

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[1] *Based on a paper by Winter (1999).*

The relationship between the integrated and the sectoral plans is that the landscape plan is a peculiar kind of preparatory document for an integrated plan, and is to be taken into account in drawing up the latter, with the goals of the landscape plan being reconciled with other, i.e., socio-economic, objectives.

Some land laws prescribe that lower-level landscape plans also take into account the provisions of higher-level integrated plans – with a consequent minimisation of the role played by the landscape plan as a tool of environmental policy. However, such a regulation does not rule out that the landscape plan include provisions requiring changes in the integrated plan.

Primary and Secondary Integration

Of the two types of German planning integration, secondary integration passes through all planning stages, including the possibility for public consultation, and producing an independent document with a map and text, called a landscape plan or a landscape master plan. However, it is included in the integrated plan. Secondary integration is commonly used, for example, in the state of Hesse. This integration method has the advantage that the goal of environmental conservancy mission is considered and formulated from the outset as an independent goal. A disadvantage, however, is that the process of preparing and processing the plan is complicated and time consuming.

Under primary integration, landscape planning is part of the integrated planning process, right through to the final document, the spatial plan. Environmental requirements in this case are reconciled from the outset with other land use interests. Primary integration is a standard practice, for example, in Bavaria. The advantage of this procedure is that administrative costs are reduced considerably. On the other hand, it increases the likelihood that environmental conservancy issues will be subordinated to other land use interests.

The Content of Land Use Plans

Typically land use plans must contain the following parts:

– Adescription of the environmental and land use situation (a text and a map), called the assessment programme;

– Binding guidelines for future land use and, more specifically, with regard to spatially oriented targets (for instance, in some place, nature conservation, and in others, commercial development), as well as with regard to the tasks beyond the boundaries of a definite territory. Some suggestions are also made for specific measures (for instance, waste water discharge is to be eliminated at residential area X). The basic principles are regarded as optional, whereas the targets are binding, inasmuch as that is generally inherent in a particular plan (which is not the case in, e.g., the conditions of secondary integration of a landscape plan – see above).

Material Requirements

The planning regulation laws stipulate requirements (criteria) to be taken into account in plans. This is especially true with regard to state assessment and to the setting of binding land use targets. These requirements general, and serve as guidelines for planning development.

Integrated plans are typically governed by the "equilibrium" rule, as exemplified by the following provision in the Lower Saxon Law on Spatial and Land Planning: "The state Government □ should compare the development potentials of particular areas, as well as the interests of various population groups in order to reconcile them. Landscape care shall also be considered".

In sectoral planning, which includes nature and landscape conservancy efforts, state-level laws stipulate that a landscape plan provide for the "requirements and measures relevant to nature and landscape conservation and maintenance of specific areas".

The Planning Process

Typically land use planning goes through four stages:

– Drafting of the project by a competent body (sometimes delegated to a private planning bureau);

– Discussion of the project with other bodies and organisations, and economic and nature conservancy associations;

– Completion of the project, with consideration for the outcome of these discussions;

– Decision-making by a competent body, such as the community council, which may constitute approval of the plan, or its further elaboration.

In the case of low-level plans, such as land use or landscape plans, public consultations (hearings) are commonly provided at Stage Two. A draft plan is presented for public information, an official announcement as to when and where it can be accessed is issued, and public discussions are held. These are sometimes moderated by a disinterested person, in order to prevent the submitter of the plan from considering suggestions in a biased manner.

Legal Status of Land Use Plans

It is customary to define the following types of legal effects of a plan:

1."Internally" binding:

a.mandatory: strict – the plan is to be "observed";

b.optional: mild – the plan is to be "considered".

2."Externally" binding:

a.mandatory: strict;

b.optional; mild.

If a plan is "internally" binding, that implies that legal force extends only to such managerial activities that create no rights or obligations whatever for citizens; it refers only to the internal area of administrative management. "Externally" binding, by contrast, signifies that a plan grants rights to citizens and imposes obligations on them. This may involve for example a housing development plan. Such a plan directly stipulates legally the manner in which land owners may use their land. Mandatory (strict) binding provisions are those which must be adhered to strictly and unconditionally, while optionally binding planning documents are only guidelines, which can be correlated with other instruments.

Landscape plans are only "internally" or optionally, binding (except e.g. in North-Rhine Westphalia). However, if integral plans are not developed concurrently with landscape plans, because, for instance, neither a land use nor a building plan exists, the landscape plan may attain a binding character, as it is the only planning document applicable. This is a further advantage of sectoral landscape planning. All lower-level integrated plans, down to building plans, are also of "internally" legal binding character. They must be strictly observed nonetheless.

The difference between "internal" and "external" legal character is difficult to understand, and there is much confusion about it. In fact, government agencies are only bound by plans of "internal" character when they pursue "outward"-directed managerial activities. Thus, if a relevant body is considering the question as to whether to grant permission to build a hotel in a wooded area, it uses existing landscape or land use plans, although the latter, by their nature, stipulate only "internal" action. This difference is designed to eliminate any possibility for interested citizens to challenge such plans in court. The argument, then, is: The plan has only "internal" effect. In our view, it would be easier to resolve this problem differently: by legally stipulating which plans may be challenged in court and which may not.

Prospects for Regional Legal Security of Landscape Planning (LP) in Russia[2]

The Relationship between Federal and Regional Spatial Planning Legislation in the Russian Federation

Under the Urban Planning Code of the Russian Federation (2004), the legal system on spatial planning has a multilevel character. Since issues related to ownership, utilisation and disposition of land and other natural resources, nature management, environmental protection, and administrative legislation are under the joint jurisdiction of the R.F. and its subordinate entities (Art. 72 Para. 1 sub-para. "v", "d", and "k" of the Constitution of the R.F.), the first level of this system is that of federal legislation.

As shown by legislative practice of most entities of the Russian Federation, regional legislation on spatial development planning has not yet really developed. On the other hand, federal laws assign an important role to the regions as regards the legal security of planning. Thus, the Urban Planning Code (Civil Code of the R.F.) (Chapter 2) defines the powers of public authorities in the entities of the Russian Federation in the drafting and adoption of legislation in the area of urban development, while Article 3 permits the adoption of such legislation at a regional level, in compliance with federal legislation.

On the other hand, an entity of the Federation may, as the basis for regional laws for particular spheres of planning activity, adopt a comprehensive framework law on spatial development planning. This is necessary to overcome the haphazard and unsystematic character of planning activity and of planning process in general. Such a comprehensive law at the federal level is no obstacle to regional lawmakers, who can introduce specific legal stipulations for their special regional situations.

Regulation in the Law of the Russian Federation on Spatial Development Planning

The idea for such a framework law on spatial development planning for the Irkutsk region emerged in the process of implementing a joint Russian-German project titled "Ecologically Oriented Land Use Planning in the Baikal Region", when it became obvious that the legal foundation was insufficient to impose binding legal force and definite legal status on land use plans as developed for model areas in the Irkutsk region: the Goloustnaya river basin and the Olkhon district. On the other hand, resolution of this challenge was unfeasible without a systemic approach to planning efforts, which was to be provided by such a law. Let us consider in greater detail the basic thought behind the concept of the Irkutsk regional law on spatial development planning. We maintain that these ideas may also be used by other entities of the Russian Federation, with due regard for their own situations, for legalisation on land use and other planning.

What Does the Term "Spatial Development Planning" Mean?

This law is essentially a pioneering effort toward generating a legal framework for land use planning in the region. "Spatial development planning" in this case is taken to mean that the plans are to define the priority areas and prospects of land use within the context of ensuring its sustainable development (a combination of the economic, social and ecological interests) in order to create favourable conditions for human life.

The law is presumed to define the general guidelines for planning, the requirements imposed on plans, the kinds of spatial plans and their interrelationship, the mechanism of preparing, discussing and adopting the plans, and their legal significance.

The Types of Spatial Development Plans

First, a distinction should be made between two types of plans: *comprehensive* and *special (sectoral)*. Unlike the latter, comprehensive plans are based on a combination of the interests of socioeconomic development of the territory plus certain special tasks,

[2] *Prepared on the basis of a paper of E.V. Gritsenko (1999).*

such as environmental protection. Sectoral plans focus on development of the particular natural sites. Since comprehensive plans rely on reconciling all possible interests, they are to take into account existing sectoral (or special) plans, such as water management, forest management, etc.

The types of *comprehensive plans* differ according to content, magnitude, planning level (i.e., the bodies that are responsible for the elaboration and adoption of a plan, and the planning territory), and legal status. Accordingly, it is customary to identify the following:

– Spatial development plan: For an entity of the R.F. (for all or part of a region);

– District spatial development plan: for municipal and rural districts, and combined communities;

– Zoning plan: For urban communities;

– Delineation plan; For a municipal district, or an urban and rural municipal district;

– Spatial plan: For land between communities; and

– Building plan: For portions of urban and rural communities, and land between communities, where construction is planned.

Obviously, this terminology for the plans under development for the Irkutsk region does not very well match that used under current federal law for plans of these types. The discrepancy is due to the fact that the Irkutsk legislature addressed a broader issue: the elaboration of an efficient system of comprehensive spatial development plans, which is still lacking in federal legislation. At issue here is thus not only urban-planning documentation as stipulated by the Urban Development Code, but rather the titles of the plans proposed in the draft version of the regional law, which are to some extent related to urban development, and do not differ from the names used in the Federal Code (zoning plan, delineation plan for a municipal entity, draft plan).

The system of comprehensive spatial development plans also includes plans still unknown to the Russian legal system, whereas under the standards of other nations, they have a fundamentally different significance. This applies in particular to landscape plans which, under German law, are sectoral (i.e. special, functional) plans. The concept of the Irkutsk law sees the spatial plan as a comprehensive plan for a community that is to be drawn up for land between communities in order to establish the spatial development for a district or for some other municipal formation, such as a combination of communities.

Thus, again, these spatial development plans can be categorised into two groups: *regional/ municipal district spatial development plans (higher-level plans), and local plans (lower-level plans).*

Division of Responsibility as regards the Development and Approval of Plans

The responsibility for the approval of a plan is shared by the administrative levels as follows:

– The regional spatial development plan, the delineation plan for a municipal entity, and the urban zoning plan, including the suburban area, are approved by the regional government bodies;

– The spatial development plan for a district (or combination of communities), the zoning plan, the landscape plan, and the draft plan are approved by the local self-government authorities.

On the Role of Zoning

Zoning is treated in current Russian urban development legislation as the necessary stage of planning (Chapter 4, CC of the R.F.). Accordingly, the Irkutsk law includes zoning for all types of comprehensive plans and is stipulated as the necessary stage of planning. Zoning involves dividing the territory into zones (delineation) and defining the allowable and non-allowable types of use (functional purposes) with regards to them.

On the Content of Plans

In the process of establishing each type of comprehensive plan, it is necessary first to cover address content (what data should be included in the plan?), the scale, and the requirements for their preparation (text, maps).

The *regional plan* (scale 1: 500,000 – 1: 1,500,000) defines administrative centres, zoning of all or part of the territory, the distribution and priority areas for improvement of residential areas, industrial, social and cultural development, development of the engineering and transportation infrastructures of regional and inter-community significance, and the identification of areas where the environment is in need of special protection and improvement. Other provisions are stipulated by federal law (Article 4).

The *spatial development plan for a municipal district or group of districts* (scale 1:50,000 – 200,000) details and specifies the provisions of the regional spatial development plan, and establishes additional provisions that determine the directions of development of a district or a group of districts.

The *spatial development plans of a community* reflect, among other things (Article 19):

– existing and planned boundaries of communities forming part of a municipal district;

– boundaries of lands of different categories located between communities;

– boundaries of territories occupied by cultural heritage sites;

– boundaries of zones with special conditions of land use;

– boundaries of land plots allocated for siting local significance capital construction projects or occupied by capital construction projects owned by a municipal district, as well as boundaries of zones for the planned siting of local significance capital construction projects; and

– boundaries of zones for the planned siting of capital construction projects on land between communities.

The *zoning plan* (scale 1:10,000 – 25,000) defines the directions and boundaries of spatial development for communities and their systems, and determines the zoning of territories and the directions of development for the engineering, transportation and social infrastructures. It defines the following types of utilisation zones (Article 35): residential, public-business and production zones, zones for the engineering and transportation infrastructures, agricultural utilisation zones, recreational utilisation zones, zones of specially protected areas, special-purpose zones, zones for military facilities, and other types of zones.

The *spatial plan* (scale 1:10,000 – 25,000) establishes guidelines for conservation, improvement and development of land between communities, and defines the following zones:

– rehabilitation zones ;

– agricultural, forestry and garden-plot zones; zones for hunting, fishery, and other pursuits;

– water management zones;

– tourism development zones;

– protected natural zones;

– zones of mining operations;

– special zones under a special management regime – scientific establishments and institutes, historic and cultural monuments, etc.;

– waste storage and processing zones;

– transportation routes;

– zones for small structures (dacha zones);

– zones for future development (no utilisation regime yet established); and

– other zones.

The spatial plan (scale 1: 5,000 – 10,000) covers certain portions of urban and rural communities and land between communities (outside urban and village boundaries) where construction is planned. For its substantiation, the following documents are to be presented in graphical form (Article 42):

– the planning structure;
– land use plan at the stage of preparation of the project;
– organisational plan of the roadway network, and map for transportation vehicles in the area;
– map of boundaries of cultural heritage sites;
– map of boundaries of zones with special conditions of land use;
– layout of vertical planning and engineering preparation of the land; and
– other documents in graphical form as substantiation for the land planning regulations.

The Relationship between Plans, Projects and Programmes

It is suggested that the region legislate special provisions on the relationship between different types of spatial development plans, and between them and federal plans, projects, and programmes. In regulating the status of lower-level plans, such as planning projects, it is necessary to determine the manner in which they are correlated with agreements for land and nature management. In the process of legislation on these issues, it is necessary to proceed from such basic planning principles as:

– The precedence of federal laws and other normative federal regulations;

– The precedence of higher-level planning instruments over lower-level ones; and

– Consideration for ongoing plans, prognoses and frameworks in the development of comprehensive spatial development plans.

Preparation procedure for plans, and participation of the general public

Under a law under development, a significant role is assigned to procedural regulations for the planning process: elaboration and discussion of the plan, including coordination and participation by the public, i.e., citizens and their associations), and submission and approval of the plan. Spatial development planning includes the following steps:

– An analysis of the existing status (existing land use policies and practices);

– An analysis of land use problems, and the need for new land use policies and practices;

– A definition of alternatives to development and new goals of land use;

– An assessment of and decision on potential land use practices in accordance with the legally stipulated guidelines;

– Specification of the particular practices of land use by zone, and definition of the use practices for corresponding zones;

– Ecological revisions for measures contemplated under the draft plan, in accordance with federal law; and

– Drafting the plan and preparation of a rationale for the selected spatial development practices in the region.

Depending on the type of plan, and in accordance with the division of responsibility for certain areas of activity between the regional and municipal levels (see above), responsibility for elaborating the spatial development plan rests with either the executive organs of the Federation or those of local self-government.

The range of entities that must be involved in discussions on the draft plan also varies according to the level and type of plan: regional and district plans are to be discussed by collective stakeholders or interested entities, while local-level plans are to be discussed by all citizens whose interests would be affected by plan.

On the Legal Status of Spatial Development Plans

The regional and district spatial development plans are to be observed by all governmental authorities in a region, and by local authorities in the following cases:

– when they make decisions, based on the data contained in the plans;

– in the process of executive and administrative activity;

– when permission is granted (subject to relevant approval) to carry out individual land use-related projects, and to change land use practices; and

– in developing and endorsing regional and local programmes.

Whenever authorities or organisations are willing to implement a project that conflicts with the guidelines of the plan, it is necessary to obtain consent from a pertinent governmental or local government authority. On the other hand, the decision to approve a district's spatial development plans, or the plans for another entity can stipulate that some of the plans' provisions have a direct bearing on persons or entities pursuing particular types of business. In such cases, binding rules apply, which are established for spatial plans and planning projects. The latter are binding upon all entities.

This list does not exhaust the challenges to be addressed in the regional law on spatial development planning. On the other hand, this document is not the only legal framework for planning at the level of an administrative entity of the Russian Federation. Based on the aforementioned framework law, as well as other federal legislation, the individual regions will develop normative acts on the different types of planning, including those related to the specific features of land use and nature management in definite areas, as stipulated by Articles 4 and 41 of the Urban Development Code of the R.F..

6.2. EXPERIENCE IN ORGANISATION OF LANDSCAPE PLANNING

Principles and Procedure of Selecting Model Areas

On the initiative of the Institute of Geography SB RAS, Russian-German efforts towards creating landscape structure plans in Russia were launched in the Baikal region (Prebaikalia). Lake Baikal, a World Natural Heritage site, calls for top priority measures of ecological substantiation for land use practices in the Baikal watershed basin. It should be noted that the natural and socio-economic conditions that are fundamentally different from those in Germany, do not permit German experience to be automatically transferred to the Russian context. For instance, in Germany where pristine natural complexes are virtually nonexistent and the level of social relations in the realm of land use is exceptionally high, the prime objective of landscape planning is to preserve natural conditions, even at the sacrifice of the interests of some groups of land users. In the Prebaikalia where the current trend is toward a degradation of the socio-economic structure, the task of planning is more complicated, and includes a need to observe the interests of the local people, as well as to guarantee natural environmental protection.

In the elaboration of "model" landscape structure plans, the first stage involved selecting two areas: the Golustnaya river basin with the adjacent shore area of Lake Baikal, and the Olkhon district (Fig. 32). This was dictated by the following criteria:

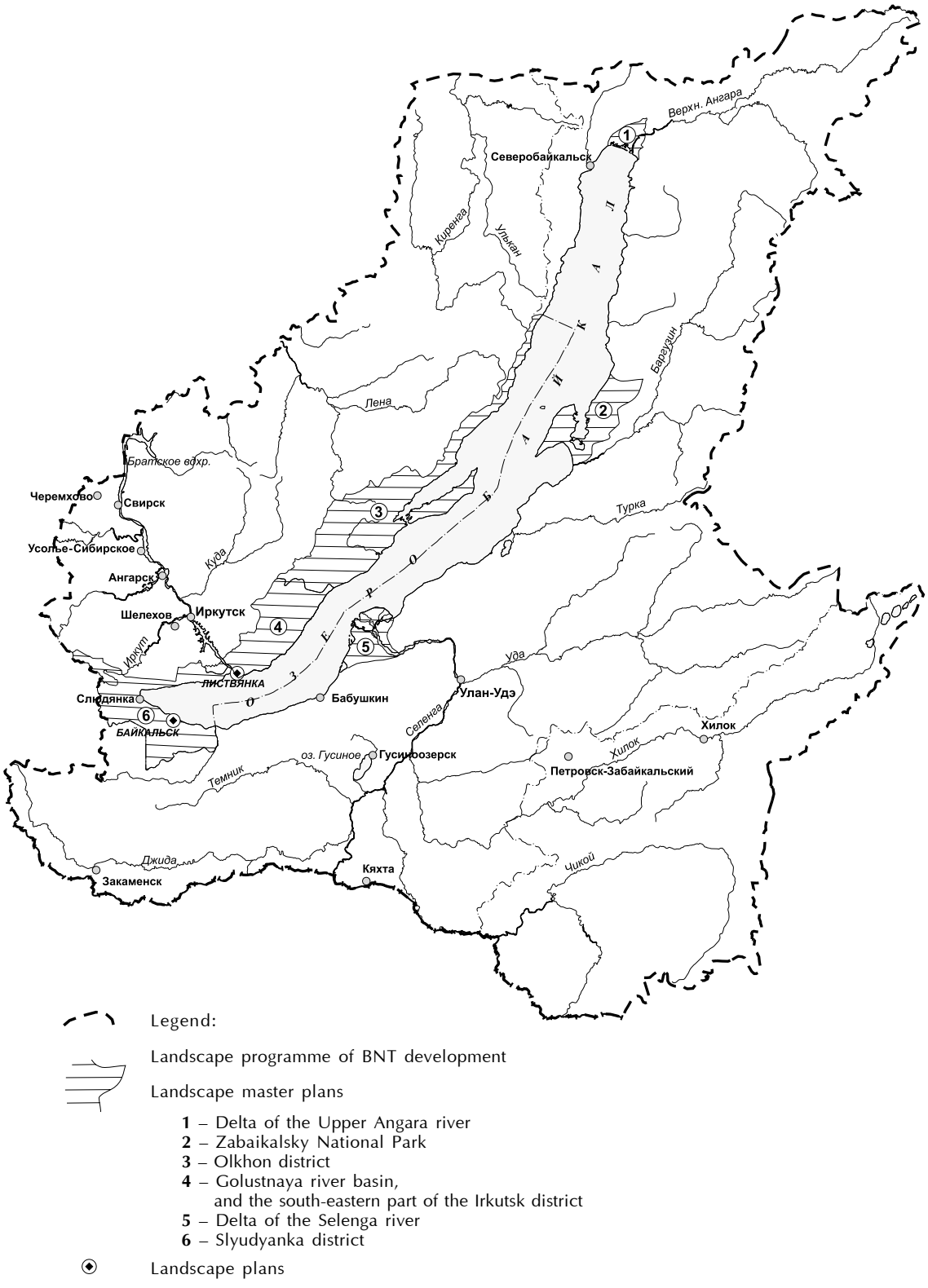
– The extent to which it is representative of southern Prebaikalia as regards natural conditions and a range of environmental and socio-economic problems;

– The extent to which input data exists, or is relatively easy to obtain;

– The extent to which administrative organs and local communities support the process, and the action of local residents in carrying out the planning procedure and subsequently implementing the decisions taken can be expected; and

– The extent to which there is any real possibility of implementing the planning results.

For the two key areas, the programme under the project envisaged projecting landscape plans at two scale levels:



Legend:

Landscape programme of BNT development

Landscape master plans

1 – Delta of the Upper Angara river
2 – Zabaikalsky National Park
3 – Olkhon district
4 – Golustnaya river basin,
and the south-eastern part of the Irkutsk district
5 – Delta of the Selenga river
6 – Slyudyanka district

Landscape plans

Fig. 32. Schematic map of model areas of the Baikal Natural Territory (BNT).

– Landscape master plans for the entire areas, at a scale of 1:200,000; and

– Landscape plans for individual parts of the areas.

The model stage was completed in 1997. In the subsequent period, a series of landscape plans showing the specific ecological problems affecting the Baikal Natural Territory (BNT) was developed. Most impressive was our landscape plan for the entire BNT at a scale of 1:1,000,000. The work was done as per Article 3 of the law of the Russian Federation "On the Protection of Lake Baikal", i.e. within the framework of ecological zoning. On the other hand, the depth of elaboration corresponds with that of the Landscape Programme (see Section 5.2).

Of equal importance were the landscape master (structure) plans (1:200,000) provided for a number of municipal entities: the Irkutsk (rural) and Slyusyanka districts. In conjunction with the plans for the Olkhon district, the system of plans connected by a common goal, made it possible to generate a plan common to all of Irkutsk Prebaikalia.

A more detailed planning effort was undertaken for the communities in the Olkhon district, the community of Listvyanka, and the city of Baikalsk. The plans were drafted at a scale of 1:25,000 and 1:10,000. These efforts resulted in a number of important decisions which facilitated the definition of ecological guidelines for a further development of residential centres in the central ecological zone of the BNT.

Sites requiring special protection have a special place in planning practice. They include the delta portions of the Selenga and Upper Angara rivers and the Pribaikalsky and Zabaikalsky National Parks. Planning decisions were made at a scale of 1:200,000 in order to clearly define the boundaries and the protection regulations.

Sectoral problems may be addressed using LP tools related to environmental impact assessment (EIA), water protection zoning and land use. Typically these efforts are carried out at a large scale (1:25,000). In this section they will be addressed as exemplifying the implementation of the LP instrument in special-purpose projects.

Thus, a number of small model key areas varied both in spatial level and in functional significance, and spread across the entire Baikal Natural Territory were used as planning objects. It was hence possible to demonstrate the extensive possibilities for implementing LP tools, with due regard for regionally specific characteristics as well as for the goals pursued. It should also be noted that, in the course of developing these plans and programmes, some novel ideas have also been developed, which have a potential for further advancing the LP methodological framework.

Organisation of the Work

The effectiveness of developing and implementing ecologically substantive and economically realistic landscape plans depends not only on the volume and depth of scientific research done as part of landscape-planning effort, but also on wise and productive organisation. The results of landscape planning – as of any other – can be effectively translated into reality only when planning is undertaken not in a legal vacuum, but on a clear normative base. Regrettably, no well developed legal framework specifically targeting landscape planning has yet been created.

When drafting documents to define regional goals and landscape planning methodology, it is therefore recommended that the existing legal base, the codes and laws of the R.F. on spatial organisation and nature management, be used as the groundwork. Each such document contains, in some form or other, directives regarding land use, zoning, and other issues which affect nature conservancy related planning practices for spatially scattered areas. It is also advisable to proceed from the expert-based significance of these documents, and from their potential uses in addressing issues of integral spatial planning as informational and analytical sources.

The effectiveness of developing and implementing ecologically substantive and economically realistic landscape plans depends not only on the volume and depth of scientific

research done as part of landscape planning operations, but also on their judicious and productive organisation. A decisive factor are favourable local conditions. For that reason, prior to a decision on the object of planning, the following information should be ascertained:

– What are the problem situations and conflicts in nature management characteristic for the district?

– What planning tasks can be resolved through project implementation?

– Who are the customers, and what are their interests?

– Are there any chances for practical implementation of the expected results from the project and the participatory action of local communities?

– What is the underlying appraisal (including cartographic) and availability of the basic information input?

– Are there any scientific and planning organisations or specialists who might participate in the project?

– What is to be the volume of work related to additional gathering of information; and

– What are the expected dates of the overall project implementation?

The primary goals and objectives of landscape planning can only be achieved through systematic interdisciplinary efforts undertaken by a large team of specialists in collaboration with state and public organisations, mass media, educational and training establishments, and the public at large. A vital requirement for preparing planning documents in a target-oriented manner is to define the range of problems and tasks to be addressed, and the addressees of the project, i.e. which persons or entities are concerned. At any rate, such documents must be understandable for the addressees and, at the same time, resolve outstanding problems.

The programmes and content of work on landscape planning, which should be a goal-oriented project, must be carefully prepared, subject to broad discussion and approved by the customer of the work concerned. It is important to get representatives of all stakeholders involved in this important procedure. It is advisable to structure the following preparatory phases for the project:

– Appointment of a team of specialists with the task of preparing the feasibility study and a detailed application for project implementation; the same applies for on-site consultation, gathering of information, and preliminary appraisal of necessary resources, material and expenses;

– Conducting a number of special seminars, public hearings, and coordination meetings on the progress of the early phases of project development; and

– Drawing up a detailed work programme for the project (including coordination and reconciliation with other, thematically "allied" projects), and defining its organisational structure; preparing and approving the project budget, indicating the funding sources and mechanisms; in this context, business games such as "target-oriented programme planning" (TOPP) are helpful.

As regards the project implemented in the Baikal region, the organisation plan of the project was as follows (Fig. 33):

Legal agencies of the project – Official entities that are responsible for funding and legal support of the project (Irkutsk regional administration);

Conciliation Committee – Representatives of research institutes, state institutions, public organisations, and citizens, as well as project leaders; this Committee reconciled the interests of all stakeholders in nature management, and formulated the strategic policies of the project;

Executive Committee – A team of experts and specialists from the scientific research institution (Institute of Geography SB RAS), primarily responsible for all exploration, survey, planning and organisational work; and

PROJECT MANAGERS	
German Society for Technical Cooperation (GTZ) GmbH	Irkutsk Region Administration, Russian Federation

	Committee
1	Regional Administration, Committee on the Economy
2	Committee on Environmental Protection and Natural Resources
3	Legislative Assembly, Committee on Legislation and Nature Management
4	Olkhon District Administration
5	Irkutsk District Administration
6	Pribaikalsky National Park
7	Irkutsk Forests Directorate
8	Committee on Land Resources/ Land Use
9	Angara-Baikal Basin Water Management Directorate
10	Institute of Geography SB RAS
11	Limnological Institute SB RAS
12	"Baikal Ecological Wave"
	(other organisations can be mentioned)

Organising team

Committee on the Economy, Irkutsk Regional Administration

Institute of Geography SB RAS

Specialised consultant (e.g., Lawyer)

Council

GTZ

German Federal Agency for Nature Conservation (Bonn)

Leipzig District Regional Presidium Leipzig

Research Officer

Planning bureau / Consultants

"Ecology + Environment", Hanover

Working groups / reserve specialists

SB RAS	Siberian Branch of the Russian Academy of Sciences
Project managers	Official legal partners who provide the financial base and are the responsible agency of the project
Organising team and Council	organisers of the work on the project and convener of the working groups
Conciliation Committee	promotes the establishment of linkage between the various groups of society
	-provides sectoral and political impulses
	-ensures a democratic process and public relations
	-supports the work on the project through the organisations represented.
Planning bureau / Consultants	exercises direct responsibility for the implementation of orders
Working groups / reserve specialists	to be involved where necessary, perform various tasks and have special functions

Fig. 33. Ecologically oriented planning in the Baikal region.

Advisory Council – This optional entity may represent a team of experts who analyse and appraise the already formulated plans, and recommend implementation of any new challenging, currently important problems and relevant methods, as well as experienced specialists, and reliable partner organisations.

Participation of Non-Governmental Organisations (NGOs) and local Communities

Active participation of public organisations is a key factor for ensuring the successful achievement of the goals of a landscape plan. Once landscape planning is initiated, it is important to have all participants and parties fully understand the role of local communities in the spatial management of natural resources. It is necessary to have a clear idea that ecologically oriented nature management is impracticable unless it is supported by local residents. Such support can be obtained by:

– Raising the level of ecological awareness of people;

– Demonstrating to local communities that nature management oriented towards an improvement of the ecological situation and biodiversity conservation serves their individual interests, and is intimately linked with their living standards; and

– Illustrating the possibilities for citizens to ensure that administrative organs take their environmental interests into account, thus demonstrating their potentialities for influencing the decision-making process.

All work with local communities along the lines cited above should focus on public movements with an ecological profile. Also, it is important that this activity involve all interested public movements which share the goals of a landscape plan and the methods for achieving them. It is recommended that in the early phase, an ecological information centre be established to start the introduction of an ecological education programme. This task that should be urgently recommended by public entities in order to instil in local residents the basis of ecological awareness and a world outlook.

With the success achieved by public bodies and with the appearance of active advocates of the ideas of ecologically oriented natural resource management, it is possible to embark on the next stage, the establishment of local associations of residents on the basis of ecological interests. Furthermore, a consolidation of residents is possible, and advisable as part of the fulfilment of individual specific measures or particular nature management programmes which comply with the recommendations set forth in the landscape plan. The management of the information centre and the introduction of an ecological education programme can be gradually transferred to local associations. The ultimate goal of this work is to create a self-organised system for local residents to ensure ecologically substantiated nature management, and a guarantee for the sustainability of the results of the landscape plan recommendations.

Monitoring Implementation

The prime objective of monitoring operations is to provide the landscape plan, and other ecological projects in the planning area with scientific, informational and methodological support at all stages of their implementation. During the course of monitoring the project work, it is equally important to promptly make amendments and updates, including modifications to goals. Such corrections are possible at any landscape planning stage; this is particularly true of the stage of implementation.

During the implementation stage, monitoring can focus on the following activities:

– Control of the effectiveness of the measures implemented, as provided by the landscape plan and other ecological projects; monitoring of the evolution of various natural environments, of anthropo-ecological effects, and economic indicators.

– Making monitoring results promptly available to all participants of the measures and to the public; issuing periodic newsletters, and drawing up individual memorandums for emergencies;

– Rendering assistance in developing proposals for updating planned and ongoing measures, if they are inefficient; current and forecast-based consultations for participants regarding the implications of ongoing measures.

The monitoring programme should be developed with due regard for the particular situation on the area and for the priority directions of its further development. The programme should be based on conceptual needs to:

– Set up an integrated ecological monitoring system, and enabling monitoring of the status of the various natural environments and the anthropo-ecological situation within the confines of relatively isolated areas; and

– Combine the background and target-oriented monitoring operations.

In this case background monitoring results provide a basis for developing the system of objective indicators of the state of the nature-human system, whereas the target-oriented monitoring operations, with these indicators taken into consideration, is designed to monitor the effectiveness of particular measures in the landscape plan and other ecological programmes, as well as to update these measures.

7. USING LANDSCAPE PLANNING TO SOLVE SECTORAL PROBLEMS

This chapter explores the possibilities of implementing landscape planning tools in tackling sectoral problems of spatial organisation: land-use, water protection zoning, urban planning, the control of environmental impacts, and others.

In many of their guidelines, such as the Urban Planning, Land, Forest, and Water Codes of the R.F., the normative foundations of spatial development strongly suggest the need for the ecological regulation of economic activities. Landscape planning is a powerful tool for enforcing these laws.

According to the Land Code, land use includes measures involving the study of the condition of land, and the planning and organisation of rational utilisation and protection. By implementing landscape planning methods in land use, it is possible to correctly assess the potential of land and carry out functional zoning. The use of landscape planning tools for water-protective zoning is illustrated by the example of shore areas of Lake Baikal. It was possible to achieve not only a delimited water-protection area of this unique lake, but an internal delimitation was also carried out to identify especially significant conservation relevant qualitative and quantitative characteristics of landscape runoff formation. For shore-based residential centres, the main pollution sources, it is proposed to create water-protective frameworks to guarantee the normative quality of waste water.

The creation of most specially protected natural areas in many Russian regions has not yet been preceded by relevant spatial planning, a delimitation of their boundaries, or identification of functional zones. The basic categories of specially protected natural areas implies, to varying degrees, their spatial subdivision into areas with conservation, landscape and biotic diversity-related goals, as well as recreational resources. Of these, national and natural parks have the greatest significance from the point of view of spatial organisation of conservation, rehabilitation and maintenance of biotic and landscape diversity, as well as the promotion of recreational and tourist activity. The zoning of the Zabaikalsky National Park is a successful example of the use of landscape planning in such efforts.

One of the final stages of landscape planning is the implementation and integration of the results into the plans for the socio-economic development of territories. This stage involves the transition to another qualitative level of implementing advanced theoretical and practical technologies in the strategy of economic and social development of municipal districts. The methodological and procedural approaches to integrating landscape and socio-economic planning of spatial development were tested using the example of the Pereslavl municipal district of the Yaroslavl region. The basic spatial information units in that effort were the rural communities of the district. The illustrative cartographic documents presented for this purpose include three main blocks that reflect the initial prerequisites, potentials, investment attractiveness, and prospects of economic and social development and management of the area under study.

The existing urban planning activities are pursued with due regard for ecological and natural characteristics of territories for settlements, and are aimed at ensuring favourable living conditions combined with management of nature conservancy processes and environmental protection, which fits in well with the general goal of landscape planning. The spatial structure of the city and its surrounding natural space are treated in a polarised landscape: On the one hand, these areas are fully urbanised, with a residential and industrial infrastructure – "cores" of the transformed natural structure that have arisen according to the laws of evolution of human society, frequently dominated by economic interests. On the other hand, the surrounding natural environment exists according to natural laws, suppresses negative consequences and serves as a buffer for the survival of relatively "pure" natural complexes.

The methods and results of landscape planning are used for assessments of environmental impact when addressing the following challenges: site selection for a project, comparative integral assessment of the particular kind of impact, and comparative assessment of the impacts of operation of the object. The procedures for solving the

above-mentioned problems using landscape planning technology are based on an identical procedural foundation. Therefore, we shall consider the principles of exploiting such technology using the example of the problem of justifying the site for the project of line structures (power lines, roads etc.), one that is typical for the Environmental Impact Assessment (EIA) procedure. In tackling this problem, two approaches should be distinguished: one for territories with spatial plans, the other for those where no landscape planning has been undertaken.

7.1 GENERAL

The normative bases for spatial development in many of their guidelines indicate a need for ecological regulations with regard to economic activities. Thus, Article 2 of the Urban Development Code of the Russian Federation, adopted in 2004, defined the guidelines for urban development. It specifically emphasises the "provision of sustainable spatial development based on spatial planning and urban zoning" through "… a balanced consideration of ecological, economic and social factors" as well as "the participation of citizens and their associations in urban development", and "… observance of the requirements imposed on environmental protection and ecological safety".

The new Code defines the practices of the key element of urban development and spatial planning which, according to Article 3, "… are binding upon governmental authorities and local authorities in their decision making". Also, it is stipulated that "the urban development relations are governed by land, forest and water legislation, legislation on protected natural areas, and environmental protection …". Of course, to enforce legal provisions in spatial development plans also requires creating relevant tools for integrating a wide variety of information, regulations, and programmes, including maps of the boundaries of these territories with special conditions of utilisation (specially protected sites, water-protection zones, etc.).

Article 85 of the Land Code of the R.F. (2001) defines general concepts regarding certification of spatial zones, including recreation lands and specially protected sites. Chapter 17 establishes the concept of specially protected areas and sites with special environmental, scientific, historic-cultural, aesthetic, recreational, health-recovery, or other value. The procedure of certifying some of them is defined by federal law. On the other hand, there is no methodological framework for developing an integral plan that would reflect not only urban development requirements for the organisation of the territory and also ecological regulation of the human activity on the land.

The main method for establishing water protection zones under the Water Code of the R.F. (1995) involves, now as before, a rather mechanistic approach to the assessment of their characteristics according to the surface area and linear size of the water body (Ordinance of the R.F. Government No. 1404 of 1996). On the other hand, the Code indicates the comprehensive character of water protection, including animal and plant habitat conservation, and the Ordinance points to a need to use the principles of landscape planning in projecting them. Thus there is an obvious methodological deficiency in addressing certain important environmental issues.

An analysis of the R.F. Law on Environmental Protection reveals an obvious deficiency as regards the large number of fundamentally important areas. First, there is no systemic tool for any comprehensive inventory of natural assets owned by the State, such as "native ecological systems, natural complexes, and natural landscape systems (Article 3). Nor are there any methodological foundations for such key procedures as spatial analysis of natural conditions when deciding on alternate location of economic units. All this leads to a weaker systematisation and standardisation of our understanding of environmental conditions, both in the country in general and in also in particular regions and districts.

A number of crucial federal normative acts can be referenced to establish management guidelines for spatial relations, and assert the comprehensive character of spatial

organisation, but this does not rely on any well-grounded and, most importantly, comprehensive system of decision-making planning. This book illustrates only some of the possibilities for employing landscape planning tools in addressing a number of particular issues. They do not exhaust the entire spectrum of problems addressed by such methods. Realistically, the near future will witness the advent of universal methods for integrating landscape plans into spatial development plans. At this stage, however, it is more sensible to use the existing legal base to achieve particular sectoral objectives by means of the targeted use of L.P. instruments.

7.2. THE LAND-USE SYSTEM

According to the Land Code of the Russian Federation (2001), the land-use system includes measures which focus on the study of the state of lands, planning and organisation of rational land use and protection, creation of new land use sites and rehabilitation of existing ones, with their definitive delineation (spatial land use organisation), the organisation of the rational use by citizens and legal entities of plots of land for agricultural production, and the organisation of land used by communities of small native peoples of the North, Siberia, and the Far East. Documents generated as a result of land use measures are used to address land protection issues, maintain the State land register, and for land monitoring.

The legal regulations of lands are determined on the basis of their being zoned for a particular category and a particular authorised use. Using landscape planning methods in land use organisation makes it possible to correctly assess the land potential and carry out functional zoning by delineating lands of different purposes with due regard for assessment of quality and sensitivity to anthropogenic stresses, current use, and the definition of goal functions of further development. Schematic maps of functional land zoning are compiled at a scale of 1:25,000, standard for land use documents.

To account for the natural-ecological conditions in spatial analysis, assessments and goal setting for development in order to provide a comprehensive substantiation for land use organisation, the most significant natural environments are represented by species and biotopes, soil, landscapes, and recreational potential.

The basic information for assessing soil, species and biotopes is obtained from the data on land use organisation for agricultural land (soil and geo-botanical maps), as well as from forest management plans for contiguous areas. Special investigations are carried out for assessments of landscapes and tourism, including studies of sanitary-hygienic and ecological conditions of tourist sites, according to the number of tourist camps and the number of tourists.

When assessing current land use patterns, lands are mapped on the basis of cartographic and archival data, and normative documents made available by committees on land resources and land use organisation, and by individual economic units, and verified for completeness and objectivity via field surveys. The socio-economic situation is analysed using census and demographic data, social statistics, primary statistical documents of enterprises and organisations, information from interviews with the heads of local administrations, local workers, and specialists, and the results of field observations. The land categories are analysed using the data of cartographic and statistical information, normative documents, and reconciliation reports on land use boundaries.

The significance and suitability of lands is only considered with regard to their use in agriculture, and separately, for pastures and hayfields. Assigning the particular areas of the territory to a definite category is accomplished according to particular numerical indices (fertility parameters, heat and moisture availability for optimal productivity of plant communities, etc.). Soil sensitivity is evaluated in terms of the degree of expression of modern soil-destructive processes, using the data on the anti-erosion stability of soils. The significance and sensitivity of soils in zones of hazardous hydrological processes are evaluated separately, with due regard for the manifestation of these processes.

The significance of biotopes is assessed by analysing the data on the sites of rare, relict and endemic plant and animal species with due regard for the structural characteristics of plant cover (diversity of life forms, species composition, etc.), occurrence, and distribution of areas of a particular land difference, as well as the compositional characteristics of animal population and its dynamics. In sensitivity assessment, special attention is paid to the effects of forest fires, logging, pasturing, summertime livestock holding, composition of vegetation, presence of rare species, projected vegetation surface cover mass and its reserves, forms of plant settlement (via wind, water, and animals), and presence of obstacles (stoniness, water content).

Landscape assessment in terms of the "significance" and "sensitivity" categories focuses on determination of the general preference of using a particular landscape for recreational purposes, based on its aesthetic attraction, the optimality of the natural environment for human health, natural comfort, degree of accessibility, socio-psychological ties and interests of various population groups, and ecological, cultural, religious-worship or other value as natural sites. The assessment of the significance of landscapes focuses primarily on their peculiarity and diversity, uniqueness (presence of rare geological formations, plant and animal species, exotic landforms, etc.), scenic attraction, and comfort. Sensitivity indicators are represented by the compatibility boundaries of a landscape, the presence or absence of unorganised recreation, climatic limitations, risk factors, and resistance and dynamical categories of landscapes.

The map of actual utilisation of lands is a key to the functional zoning procedure. It is compiled for the purpose of illustrating the spatial and natural-economic structure of agricultural land use, the distribution of land reserves between land users, these reserves' production specialisation, the distribution of human settlements and production units (stock-rearing farms), and the ethnic composition of the population. The map shows the delineation of registry zones, administrative territories and land categories – agricultural, residential, industrial, power generation, transportation, communication, radio and television, informatics, cosmonautics, defence, security, other special purpose, specially protected areas and projects, forest reserves, and water reserves – and land users, irrespective of jurisdiction.

The actual utilisation of lands is shown on the map legend by colours, point symbols and standard symbols. Land ownership is shown by boundaries and, in part, by background colour. Colours are also used to highlight the particular plots of usable land. Colours also designate lands belonging to farmsteads and non-agricultural land users. Lands controlled by local authorities are shown by darker shades of the same colour used for other land users or owners.

Point symbols are used to show the location of natural and cultural monuments, the types of anthropogenic stresses, the presence of administrative centres of various levels in communities, as well as production units, the social infrastructure, and their jurisdictions.

To show the significance of agricultural lands, the actual land use map uses a three-level scale of productivity (high, moderate, and low). The level index is applied on the map, and the legend indicates the value of a single score (point) for productivity (given in centners/ha; a centner is 1/10 ton; in this book, the values are converted to tons/ha) for cereals: For arable land, dry mass of grass: For hayfields and pastures (as an average for the lands within the boundaries of each rural and village administration). If the differentiation of official appraisals is only minor, or is not used for unsuitable lands, interviews should be conducted with local residents, farmers, directors and specialists of production units and administrations, in order to ascertain their appraisal of their localities as regards productivity and its significance for economic management. These appraisals are also ranked in three levels.

The contents of each map of actual utilisation of lands that exhibits the agro-territory governed by a particular rural or village administration, is reflected in a separate, legend.

The conclusive map titled "Integrated goals of spatial development. Functional zoning" Fig. 34) combines zoning of the types of spatial development goals, shown in colour, and economic functions of the territory, shown by corresponding shading.

Legend to Fig. 34

Integrated Goals of Spatial Development

Type of goal		Economic function of area	Brief natural characteristic	Brief natural characteristics
Retention of present status. Abandonment of use	**1**	Environmental conservancy	Reserve management. Reservation to preserve rare animal and plant species. No economic activity whatever permitted (ban on animal pasturing, hunting, tourist centres and camping sites, and unorganised visits).	Habitats of plants and animals on the Endangered Species List: rocks, screes, taluses, fixed and semi-fixed sands, heavily stony dry-steppe areas, separate forest stands with high sensitivity and high significance biotopes and soils (predominantly of low significance for agricultural and recreational uses)
Retention of present status. Abandonment of various types of use	**2**	Predominantly nature conservancy	Reserve management. Limitation on pasturing, strict regulation of grazing practices (grazing is seen as part of nature management if the composition and structure of existing vegetation is preserved). Regulated hay-making (periods and rates restricted). Strictly regulated tourism (ban on tourist centres; regulation of loads; establishment of a nature trail network). Uses of any kind – under supervision of nature conservancy agencies.	Habitats of rare plant and animal species and communities – predominantly dry-steppe areas with high sensitivity and high significance biotopes and soils
	3	Nature conservancy combined with multi-sectoral (diversified) farming	Limited pasturing , and strict regulation of grazing. Regulated hay-making. Protection measures for rare and endangered plant and animal species. Supervision by nature conservancy agencies.	Same for farming territories
Retention of existing use	**4**	Predominantly nature conservancy	New types of activity limited by need to preserve natural regimes. No intensification of existing use permitted. Traditional use practices permitted under supervision of nature conservancy agencies: gathering of wild-growing forest products and licensed hunting.	Swamps and shrubbery along rivers, rocks, semi-fixed sands with high sensitivity, low significance biotopes and soils (agriculturally unsuitable lands)
	5	Provision of population with forest products, soil protection, and water protection	Neither intensification of existing practices nor promotion of new activity permitted. Traditional use practices permitted under supervision of nature conservancy agencies: gathering of wild-growing forest products, and licensed hunting. Forest care, and regulated tree felling	Forested territories with predominantly high sensitivity, moderate significance biotopes and soils
Limited use	**6**	Provision of agricultural animals with natural pasture fodder	Use limited by low productivity of lands and high sensitivity of soils to grazing. Free grazing. Limited pasturing and regulation of grazing practices.	Near-top surfaces and steep mountain-steppe slopes, predominantly with moderate sensitivity, moderate and low significance soils: productivity: low; quality of fodder: low or moderate

Use	**7**	Provision of agricultural animals with natural pasture fodder	Use as main rangelands. Pasturing by traditional methods and with load standards.	Gentle dry-steppe slopes and intermontane declivities predominantly with moderate sensitivity, moderate significance biotopes and soils productivity: moderate; quality of fodder: moderate or good
	8	Recreational	Licensed fishing. Regulated tourism. Standardisation of recreational loads. Infrastructure development for recreation. Micro-reservations for endangered species.	Dry-steppe and meadow-steppe leveled surfaces and foothills adjacent to bays, predominantly with moderate sensitivity high significance biotopes and soils
Intensified use	**9**	Provision of agricultural animals with natural pasture fodder	Use as main rangelands. Pasturing by traditional methods and with load standards; also pasturing with hay-making – grazing turnover and additional sowing of grasses.	Steppe (including poorly forested and shrubby), meadow-steppe gentle slopes and intermontane declivities predominantly with moderately and low sensitivity, high significance biotopes and soils. Productivity: high or moderate; quality of fodder: good; suitable for additional sowing of forage grasses
	10	Gathering natural forage for hay	Hay-making by traditional methods, with melioration.	Moderate and low sensitivity biotopes and soils of meadows
	11	Agricultural production	Farming by ecological standards.	Arable lands and kitchen-gardens outside residential centres
	12	Multi-sectoral (diversified) farming	Multi-functional agriculture with ecological standards.	Farmland
	13	Recreational	Regulated tourism. Standardisation of recreational loads (less stringent than for the “Use” goal type). Infrastructure development for recreation. Micro-reservations for endangered species.	Meadow-steppe and dry-steppe level surfaces and foothills predominantly with moderately and low sensitivity high significance biotopes and soils
	14	Residential, production, and scientific-educational	Measures for sustainable provision of energy and water, solid and liquid waste disposal, and infrastructure services to population. Also agricultural and forest product processing units, purchasing organisations, etc.	Residential centres, seasonal livestock-breeding farms, scientific-production bases, quarries, and industrial areas
Intensified improved use	**15**	Recreational	Local biological recultivation with controlled tourism. Periodical removal of individual areas from utilisation in order to rehabilitate disturbed natural regimes.	Meadow-steppe and dry-steppe leveled surfaces and foothills predominantly with disturbed moderately and low sensitivity high significance biotopes and soils
Improved use followed by assignment to category Retention of present status. Abandonment of use	**16**	Nature conservancy	Removal from use, followed by rehabilitation and assignment to the category “Conservation. Abandon use”.	Meadow-steppe and dry-steppe leveled surfaces and foothills predominantly with disturbed moderately and low sensitivity, high significance biotopes and soils
Improved use, followed by assignment to category “Retention of existing use”	**17**	Predominantly nature conservancy	Temporary removal from use, follows by biological recultivation and assignment to the category “Retain existing use”	Non-fixed eroded sands with high sensitivity, low-significance biotopes and soils
Improved use, followed by assignment to “Use” category	**18**	Recreational	Temporary removal from use, followed by rehabilitation and assignment to the “Use” category	Meadow-steppe and dry-steppe level surfaces and foothills predominantly with heavily disturbed moderate or low sensitivity, high significance biotopes and soils

The map shows the basic economic functions of the territory, such as:

– residential;

– industrial;

– agricultural (output of plant-growing products, the provision of agricultural animals with naturally grown feed, gathering natural forage to produce hay, multi-sectoral farming, etc.);

– provision of the population with forest products;

– recreational;

– nature conservancy; and

– predominantly nature conservancy (among other things, in combination with multi-sectoral farming).

The legend to the map gives a brief natural outline of the zones identified, indicating the modality of usage for each zone. The map also shows the boundaries of the areas recommended for transfer to another category of main economic function; the location of the zones of archaeological sites covered by a sufficient volume of exploration, where protective measures are required, as well as the measures recommended to provide the infrastructure for human settlements and seasonal cattle-raising farms. A combination of types of goals and economic functions makes it possible to recommend a particular modality of land use, as well as, in a general form, the key action and measures focusing on the achievement of development goals, in accordance with the recommended modality of land use.

Fig. 34 presents a portion of the schematic map for functional zoning of agricultural lands in the Olkhon district (Irkutsk region) within the boundaries of the Pribaikalsky Natural Park.

7.3. WATER-PROTECTION ZONING

General

A most representative example of the implementation of the LP tools is water-protection zoning. Not only do the most complicated water-ecological situations occur In water-protection zones (WPZs), but these are also the points of conflict between land and water users. On the other hand, the areas adjacent to water bodies represent in a concentrated form the most intricately organised landscape-hydrological systems (Antipov & Fedorov, 2000). Three zones can be identified here: gravitational water formation, transit, and discharge. The high moisture content of soil materials supports hydrophilous plant communities, which results in a high transpiration levels.

Traditionally, coastal and shore areas have attracted settlements and industry. Anthropogenic interference has resulted in direct contamination of streams, an intensification of erosion, and many other impacts. As a result, efforts have begun to impose sensible land use practices for water and environmental protection. Under the law, the WPZ size is based on the relationship between the length of streams and the area of a lake or reservoir, and the width of the water-protection zones (Ordinance of the R.F. Government No. 1404 of 23 November 1996 "Regulations on Water-Protection Zones…". This approach has obvious deficits:

– The natural situation of the territory is only taken into consideration indirectly, specifically when it involves a coastal protective strip;

– The package of measures to avoid surface water contamination has a largely preventive character, and the self-purification and flow regulation processes in the basins are disregarded; and

– The determination of WPZ width on the basis of river length and lake surface area is apparently reasonable, but it is not substantiated scientifically.

On the other hand, this Ordinance makes it possible to provide a preliminary appraisal for a WPZ, which is important where a water body has been poorly studied, i.e. one can only make a minimum allowances for its width. Water-protection zoning must rely, on the one hand, on specifying the outer boundary, and, on the other, on its internal differentiation according to the array of natural-ecological indicators. As an example illustrating our proposed system of water-protection zoning, we present WPZ planning for the Lake Baikal shore area below. The goal function in zoning is represented by the requirement for the preservation of the state of ecosystems, where pollutants are discharged into Lake Baikal in the range of their naturally occurring variations and the self-cleansing and flow-forming potentials of rivers and landscapes are sustained over their water-collection areas. Predicting the ecological state of landscape-hydrological systems is based on an assessment of critical loads (existing and recommended water derivation and discharge of pollutants) and the conditions for performing the basic hydrological functions for various phases of water regime, and for various landscapes or their elements.

The Concept of Water-Protection Zoning for the Lake Baikal Shore Area

The concept of identification of the WPZ is based on the landscape-hydrological approach to studying the mass and energy exchange processes in typological elements of landscapes. Identification of these processes is possible in a broad natural context, with due regard for those criteria and indicators which let the landscape perform its main function, the preservation of the standard quality of water entering Lake Baikal from the watershed basin.

The water-protection zone is a territory within which economic activities are regulated in accordance with the requirements to preserve or improve the water-ecological situation and the self-cleansing potential of landscapes. On the other hand, an array of recommendations (including bans) on economic activities results, the impacts of which on the water ecology cannot be neutralised through the natural water-protective functions of the area, or through compensation measures.

The WPZ concept in many respects assumes that the runoff (including pollutants) proceeds on the surface. In this case, the path length along which total infiltration (seepage) of water that has entered into the ecosystem occurs (the linear size of the WPZ), and the surface area over which the surface runoff is possible (the WPZ geometry) are important factors. However, given the structure of the landscapes adjacent to Lake Baikal and the characteristics of their components, it is necessary to use calculations or other instruments which consider mass and energy exchange and flows toward the base of drainage.

Problems related to water-protection zoning can be discussed in terms of the processes responsible for some of the hydrological functions of landscapes, such as flow regulation (FR) and flow formation (FF). The water-protective functions of landscapes appear with the best combination of FR and FF, dependent on transformation conditions of atmospheric precipitation within the morphological subdivisions of landscapes, largely under the influence of vegetation and soil-ground complexes. They must be identified at a scale corresponding to the scales of hydrological processes, which makes it possible to determine the conditions under which the landscapes effectively perform their water-ecological functions.

In undertaking water-protective zoning, with the area's natural specific features considered, it is possible to draw on existing practices used to identify water-protecting forests. It is customary to identify the following functions for such ecosystems: water-protecting, water-regulating, soil and bank-protecting, anti-erosion, and sanitary-protecting.

Special attention should be devoted to areas directly adjacent to the lake's waterline, such as shore areas that are hydraulically open systems. A characterisation of such systems involves an important element, particularly the need to estimate the flows of pollutants into the lake by, e.g. ascertaining the following hydrogeological features:

– the geological situation along the lake's perimeter;
– the parameters of hydro-geological blocks (aquifer complexes) that touch the lake;

– water content in quaternary sediments;

– the sediment thickness, and the geometry of the debris cones;

– direct stream flow losses for rivers and creeks in the on-shore zone;

– the regime of groundwater tables in the on-shore zone; and

– the structure of the aeration zone and potential for seepage of rainfall and water (discharged onto the relief) down to the groundwater table.

For the other natural components, or formation media for hydrological processes, the system of parameters to be assessed is also as varied.

The establishment of a WPZ at Lake Baikal is necessary to regulate nature management practices for the areas adjacent to the lake, for which there is a strong possibility that pollutants can enter the lake. The long-term anthropogenic changes in the landscape that act to impair their water-protective functions should also be considered. The existing constraints on economic activities for areas drained directly into Lake Baikal must be reconciled with their hydrological, hydro-geological and hydro-chemical characteristics, primarily with those processes which determine the self-cleansing and ecosystem protection capacity of Lake Baikal against pollution and contamination.

The following points are central to the certification concept of the Lake Baikal WPZ:

– Certification of the WPZ is an element of landscape-ecological zoning of the water-collection basin of Lake Baikal.

– The WPZ represents a composite of landscape-hydrological complexes (LHC) with their inherent structure of water turnover or cyclical, hydrological functions, and water-ecological potential.

– The main elements of the WPZ are areas with high water-ecological potential directly adjacent to Lake Baikal.

– Within the WPZ, the basic goal function of maintaining the standard quality of water entering Lake Baikal must be maintained.

– The package of constraints on natural resources utilisation within the WPZ must be differentiated within its various LHCs.

Specifying the framework for WPZ is based on identifying the area with characteristic properties of matter and energy exchange: very low and very high flow-regulating and water-protective functions. The other LHCs adjacent to Lake Baikal are thus classed as elements of the WPZ with a different set of constraints on nature management, and a different measure of responsibility.

Thus, the chief objective of the water-protective zone is to provide a functional landscape-hydrological rationale for territories with a different water-ecological potential, to integrate the territories thus identified into a single water-ecological zone with its boundaries delineated, and to develop programmes and measures to sustain the water-ecological properties of the areas adjacent to Lake Baikal.

The Principles of Identifying and Planning the Water-Protective Zone

Water-protection zoning for Lake Baikal is a large scale project, based on physico-geographical sectoral and landscape maps. The goal function involves protecting surface and groundwater of the area directly drained by the lake. According to estimates of the flow-regulating and water-protective functions of various landscapes, a single water-ecological scale is developed, and the area of the water-protective zone is accordingly differentiated. This procedure provides the basis for applying the goals of spatial development and land use patterns. Planning the WPZ with due regard for the natural-ecological conditions relies on fulfilling a number of conditions:

– The area from which all runoff drains directly into Lake Baikal must be delineated. The boundary must be established, usually initially with respect to the lake, watershed basins of creeks and temporary streams.

– First, and, on some occasions, second-order river basins must be incorporated.

– Debris flow hazardous watersheds must be incorporated.

– As regards the riversides of medium and large-size rivers outside the WPZ, it is to be assumed that all pollutants are drained directly by streams.

– The WPZ width for the rivers outside the Lake Baikal WPZ must be established according to standards, or adjusted according to the types of valleys or hydro-morphological process.

– Within the WPZ, it must be possible to establish an on-shore protective zone equal to the path length of total seepage of water that enters its outer contour.

– The degree of groundwater protection must be taken into consideration.

– The framework for the WPZ is provided by complexes with very high and very low water-protection and flow-regulating functions. Their best combination is achieved at significant forest density or steep-slope conditions of vegetation growth.

– Non-wooded areas are classed according to their rate of soil linkage of moisture exchange, and by the presence of water-protective geo-chemical potential; the latter factor largely determines the degree of groundwater protection in aeration zones.

– In the event of a mismatch between subsurface and surface watershed areas, it is recommended that the WPZ incorporate the region of groundwater recharge.

– For each aquifer complex, groundwater flows and the residence time of groundwater in subsurface collectors must be estimated.

– For overmoist areas with gradients of less than 30, the WPZ boundary must be established arbitrarily by delineating the areas of hydromorphic soil types.

– The ecological status of the various complexes involved in the WPZ can differ drastically (absolute protection, limited development of a particular kind of activity, and rehabilitation, retention of existing status, or extensive activity).

– For outlet areas of large and medium-size rivers, WPZ planning is carried out at a larger scale.

– For urban-like residential areas, and for cities, spatial development plans and WPZ projects must be developed.

– The problem of establishing the WPZ for rivers flowing within urban areas has no normative base and must be addressed separately.

When planning water-protection zones, it is proposed that a definite sequence of steps be followed, as presented in Fig. 35. Based on an analysis of existing water-ecological or natural-geographical problems, as well as legal definitions, the early stages formulate the goal function of water-protection zoning. Such analysis has been suggested above, and some general definitions provided. The second stage includes information-analytical efforts encompassing investigations into the individual natural environments within the context of their effect on the hydrological organisation and the water-ecological situation. The applications for zoning of the Lake Baikal shore area, considering the established goal function, specified the following environmental factors: the soil-vegetation complex, the geological/geo-morphological and hydro-geological structure, and landscape forms of spatial differentiation.

A crucial stage is the conversion of the sectoral assessments of natural environments to parameters of hydrological functions, i.e. the landscape-hydrological analysis of the area. The results of such an analysis are used for water-protection zoning as such.

Thus, a sophisticated, inherently logical array of concepts regarding the organisation of the Lake Baikal water-protection zone has emerged. Obviously, relevant planning calls for in-depth knowledge of the natural conditions for runoff formation and potential pollutant flows, both from the surface and the subsurface. It is necessary to have exten-

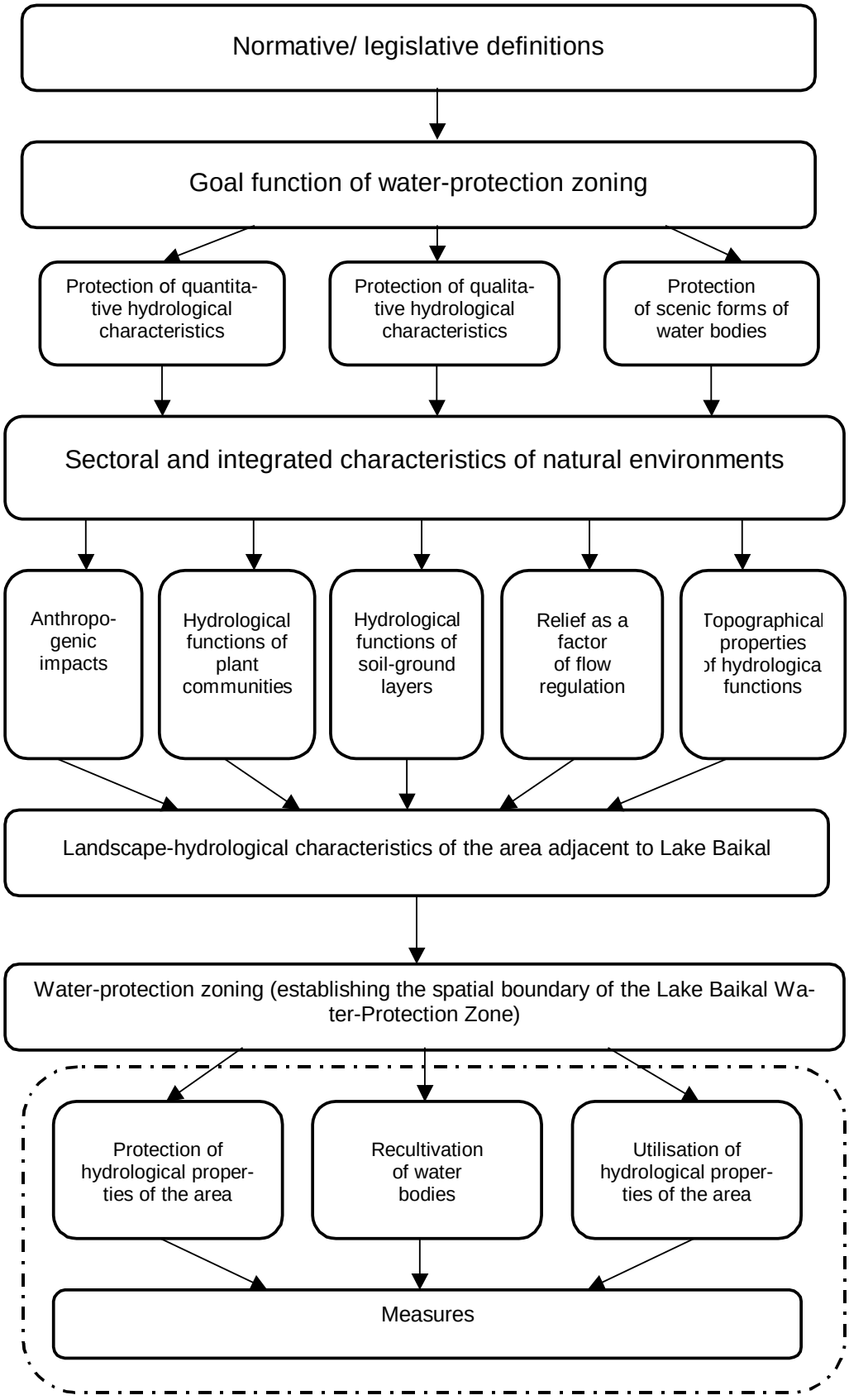


Fig. 35. Planning diagram for the Lake Baikal Water Protection Zone.

sive information on the landscape situation, the typology of forests and soil cover, the occurrence of major aquifer complexes, gradient maps, etc.

It is also important to focus on addressing environmental challenges in watershed areas rather than in rivers and water bodies, i.e. with emphasis on prevention rather than elimination of the consequences of pollution. Implementing the package of water-protection measures in watershed areas of small mountain rivers involves a combination of problems related to water and forest management – and demands conservation of those landscape conditions which do most for flow regulation and water protection. Obviously, the main form of prohibition for the WPZ area would be a ban on direct discharges of contaminated and polluted waste water into water bodies, including rivers, streamlets, and the lake itself. This implies developing a sewage system, introducing water-saving technologies, and circulating the water supply. These problems are addressed in the last stage of water-protection zone planning.

Fig. 36 Shows an example of a water-protection zoning effort for a part of the Lake Baikal shore area.

Water-Protection Zoning in the Town of Baikalsk

General

Water-protection zoning of technogenically disturbed territories is based on taking into account the actual state of naturally occurring processes responsible for the transformation of atmospheric deposits and pollutants *en route* towards Lake Baikal.

The goal function mandates maintenance of the quantity and quality of the surface and subsurface water entering Lake Baikal. This requires sustaining the natural ecosystems to ensure its water-protective functions, and conservation of the environment-protecting and environment-shaping properties of the area, and its aesthetic appearance.

Assessments are made for all natural components and their blocks that determine the area's water-protective potential and its natural and anthropogenic changes. Water-protective potential means the ability to preserve the quantitative and qualitative characteristics of water in landscapes and subsurface collectors, and the possibility to of neutralise pollutants that reach the ecosystem. On this basis, assessments are made of the possibilities of actual land use for the area, and recommendations are given for its water-ecological substantiation.

The main criteria that determine the area's water-protective potential are the indices of the state of the underlying surface (soil-vegetation cover) and the water-enclosing thickness of rock and soil which determine the degree of economic exploitation of the area with ecological consequences, with their possible neutralisation through self-cleansing processes or minimal compensation measures.

The criteria base for water-protection zoning of the town of Baikalsk and its immediate surroundings is provided by the following set of spatially differentiated indices of the natural environment state:

– minimum depth to groundwater;

– fluctuation amplitude of the groundwater table;

– groundwater quality and its deviation from the undisturbed state;

– surface water quality;

– flooding zones and states of water-protection zones of rivers;

– runoff logs, temporary streams;

– water-carrying supply systems;

– seepage and water-protective functions of soils;

– soil cover pollution, including atmospheric pollution;

– anthropogenic disturbance of the area;

– ultimate composition of the aeration zone;

– geo-morphological types of the terrain;

– rate of seepage flows.

The following subordinate factors of surface and subsurface runoff are also considered:

– Runoff regulation on landforms, i.e. the share of runoff transported on the surface;

– The seepage ability of soils, which is largely determining by runoff regulation, including technogenic flows;

– The existence of zones of interaction between fluvial and subsurface water formed in the area;

– Localisation of the slope runoff within "inner" watersheds, i.e. identification of the zones of influence of anthropogenic pollution sources upon the fluvial water conditions in the segments of transit streams;

– Transformation conditions of subsurface water of the aeration zone (thickness and lithological composition) for estimating the recharge rate of subsurface water;

– Qualitative changes in water composition due to pollutant sorption by the soil cover and through its dilution by groundwater flows.

The prime objective with regards to water-protection zoning of the town of Baikalsk are:

– To identify the zones of effect of anthropogenic pollution points on qualitative characteristics of surface and subsurface water for the main phases of the water regime, and changes in subsurface water quality since the foundation of the town and of the the Baikalsk paper-and-pulp plant (BPPP);

– To estimate the degree of protection of subsurface water, based on estimates of the seepage and sorption ability of the area's soils and lithological composition of earth materials in the aeration zone;

– To determine the origin and degree of hydraulic interconnection between fluvial and subsurface water;

– To estimate the intensity and character of erosion-debris flow processes in the area;

– To estimate the subsurface runoff and discharge of pollutants into Lake Baikal;

– To assess the area's geological risk.

The basis for water-protection zoning of the area is provided by maps, showing the state of natural environments modified using landscape planning technology. Also, while adhering to the concepts related to the directions and goals of spatial utilisation, we consider abandoning the use of the "significance" and "sensitivity" criteria adopted in landscape planning; rather, it would be appropriate to use directly the indices determining the water-ecological potential, such as "development", "rehabilitation", and "conservation", especially for disturbed territories.

Thus, the goal of integrated water-protection zoning is to determine and assess the degree of realisation of those natural processes which shape and regulate the qualitative composition of surface and subsurface water. Depending on the state of the natural environment and its spatial differentiation, anthropogenically polluted water can undergo natural self-cleansing. This does not rule out observance of the guidelines envisaging for the protection of surface and subsurface water against pollution, which are of especially urgent importance in residential areas along the rivers and Lake Baikal.

Water-Protection Zones

As a result of examining the state of natural environments and anthropogenic disturbance of the urban territory of Baikalsk and its immediate surroundings, in accordance with landscape planning techniques, the following zones have been identified (Fig. 37):

Zone of Conservation:

a) of the existing state:

b) of the existing utilisation with elements of improvement.

Zone of Development:

a) extensive;

b) intensive.

The zone of preservation of the existing state encompasses areas occupied by environment-shaping and water-protective natural complexes. The natural complexes of this zone are typically dark-coniferous landscapes on steep hillsides (slopes), wet near-channel forests, and wetland areas along the Lake Baikal on-shore area.

In this zone, the following nature management guidelines should be observed:

– conservation of the existing landscape structure and its integrity in order to reduce linear erosion and regulate surface and subsurface runoff;

– abandonment of activities which might cause disturbance of soil cover (tree felling) and surface runoff (roads, dikes).

*The zone of preservation of existing utilisation*with improvement elements includes areas of urban and industrial-economic development. The need to carry out efforts involving recultivation and clean-up of the area is due to its high pollution level. For that reasons, pollutants enter streams and subsurface aquifers (seepage). Additionally, this zone includes areas in the immediate vicinity of industrial parks, with which they exchange water, and are thus potentially subjected to the entry of pollutants via both surface and subsurface routes.

The key guidelines of nature management include:

– recovery of the qualitative and quantitative characteristics of surface and subsurface water;

– environmental optimality of the processes of residential and industrial development;

– observance of water-protection zoning criteria for gardems and recreational zones;

– prohibition of the siting of sources of pollution without prior measures to block the routes by which they could reach surface water bodies and subsurface aquifers.

The zone of extensive development. This zone includes areas occupied by small-leaved plant complexes and sparse wood stands on surfaces with moderate gradients and moderate and high values of soil permeability. The depth to groundwater in these areas ranges from 5 to 10 m. Economic development of areas with significant gradients (15-300) must be regulated to prevent erosion. The low level of subsurface water protection and the high permeability of soils place constraints on the potential development of the area, and make measures for the prevention of the entry of pollutants into the relief, the water bodies and the aquifers necessary.

In the extensive development zone, the following nature management guidelines apply:

– landscape-hydrological complexes should be subjected to impacts in a regulated manner, with due regard for anti-erosion measures;

– measures must be taken to collect (or channel off) pollutants, followed by their safe disposal in certified sites where their entry into the landscape is excluded;

– landscape planning for areas assigned for building and horticultural cooperatives must take due consideration of the water factor.

The zone of extensive development spans valley and gently sloping areas, and features small-leaved plant complexes, vacant plots of land, and sparse wooded stands. The area is not drained by rivers, and depth to groundwater is 10-25 m or deeper, so that the

seepage flow is not disturbed and has natural dynamics. These conditions, coupled with high seepage and sorption properties of the soil and insignificant surface gradients, provide the necessary conditions for a minimal entry of pollutants into water bodies. Impacts on the landscape-hydrological complexes of the zone of development must allow for a recovery of the water balance over the range of its natural variations.

The Water-Protection Framework for the Town of Baikalsk and its Suburban Area

The urban centre and its suburban zone have a special ecological status, as they are geographically located in the central ecological zone of the Baikal Natural Territory (BNT). According to the Ordinance of the RF Government No. 1404 of 23 November 1996, ecological zoning for such communities is determined by the particular conditions of their planning and development, in accordance with approved spatial plans. The normatively specified width of the water-protective zone and the on-shore protective strip of Lake Baikal (500 and 100 m, respectively) are subject to some changes due to natural conditions and anthropogenic disturbance as the natural complexes.

In the suburban areas, the water-protection zone of Lake Baikal encompasses an area where depth to groundwater is minimal – no deeper than 5 m,– so that it has the least protection against pollution. In the areas of urban and industrial development, this is reduced, to the relatively undisturbed natural region of the lake's on-shore area.

The on-shore protective strip of Lake Baikal is a 200-meter zone covering a relatively undisturbed area. The coastal defensive strip (CDS) has been expanded in this area as additional protection for near-surface groundwater, coastal stretches undergoing abrasion processes, and the wetlands. In the other part of the coastal strip, the CDS boundary largely coincides with the WPZ boundary. In some places, it is drawn as far as the embankment of earth roads or railroads, which serve as barriers to naturally occurring processes (surface and subsurface runoff, erosion processes).

Since the coastal defensive strip acts as a buffer against pollutants flowing towards the water body, very strict nature management guidelines are proposed for this area, in addition to those listed above for the zone of conservation of existing status (including the water-protection zone). The following bans apply:

– Agricultural activity (ploughing, pasturing, fertilising, etc.);

– Siting of garden-plot and *dacha* parcels, waste cooperatives, and construction sites;

– Laying of access and motor roads;

– Parking lots and automobile transportation;

– Establishment of seasonal tent camps.

Considering the specific character of Baikalsk and its negative role as the source of pollution flowing into the lake, the water-protection zoning efforts undertaken provide a means to create the water-protection framework for the area, which constitute a system of spatially imposed constraints on economic activities to ensure a standard level of subsurface and surface water entering into the lake. This also means an optimal water drainage regime, as well as a decline of erosion (including abrasion) processes, and a decrease in the hazard of debris-flow, icing and other adverse hydrological phenomena. The water-protection framework comprises the following functional elements:

– The water-protection zone of Lake Baikal proper, and its most significant component, the coastal defensive strip;

– WPZs of all water bodies (including temporary ones), and rehabilitation-protection zones of water intakes;

– Areas requiring recultivation and improvement (rehabilitation), collection of storm rainwater, and other measures to prevent surface and subsurface water contamination and pollution;

– Areas of intensive recharge of surface and subsurface water.

This involves a concurrent account of all sources of anthropogenic transformation of the water environment, its spatial differentiation, and the possible forms of impact. As a result, the water-protection framework for a community has been created, to ensure standard conditions of the water flow into Lake Baikal, and potential possibilities for socio-economic development of the area.

7.4. LANDSCAPE PLANNING FOR ESTABLISHING SPECIALLY PROTECTED NATURAL TERRITORIES

General

The creation of Specially Protected Natural Territories (SPNTs) in many Russian regions has not yet been preceded by relevant spatial planning, a delineation of boundaries, and identification of functional zones. Some SPNTs do not include areas that are crucial in terms of the species, populations or types of landscape under conservation for particular areas. Pribaikalsky National Park, for example, that was originally conceived as a game reserve for large ungulates, does not include the main routes of their migration within its boundaries, while the declared protection of special steppe landscapes that are "detached" from their key locations has not been pursued, as these lands have not been removed from traditionally established agricultural utilisation.

In some cases, SPNTs include human settlements; furthermore, because of the nature conservation regime, these communities' urban development plans do not provide so-called "development zones" or "suburban zones SPNT zoning is often carried out without taking into account the existing usage and status of lands adjacent to the protected areas. For instance, the boundaries of some SPNTs include lands designated for agricultural purpose, lands of *Goszemzapas*, industrial lands, and lands of service and transmission lines that essentially cannot be of "natural" character. One example of mistaken structuring of an SPNT that has given rise to long-lasting conflicts is the Tunkinsky National Park whose boundaries coincide with those of the administrative entity. In order to settle conflicts and allow significant use of areas belonging to these national parks by the local communities, it is necessary to reconsider their boundaries and alter their functional zoning, based on the law and on ecologically oriented land use planning tools, i.e. landscape planning.

Consequently, as early as the stage where the establishment of an SPNT is certified, it is necessary to take into account existing land ownership and use, and the manner in which these could be modified in order to avoid the above-mentioned situations or the emergence of conditions which would preclude optimal management of the area and the attainment of the intended environmental goals. Prior to organising the protected area, it is necessary to examine the natural value of each area, including those to be used for recreational and tourist activities, and to plan the spatial distribution of various practices involving protection and utilisation.

In accordance with the law "On Ecological Revision" (1995), it is necessary to analyse and review the work done on substantiating the establishment of SPNTs. For the entire period of arranging and substantiating new SPNTs, the Law provides the possibility that the regional executive authorities determine that the decision a status of "reserve area" be assigned to such areas, with tentative boundaries, with a view toward natural environmental conservation in areas defined by the list of the RF entity as "a planned SPNT" (under the Federal law "On Protected Natural Areas", 1995).

The main SPNT categories imply, to varying extents, a spatial division into areas having different goals for the conservation and utilisation of the landscape and biotic diversity, as well as recreational resources. The most significant of these, in terms of spatial organisation of conservation, rehabilitation and maintenance of the biotic and landscape diversity, and the promotion of recreational and tourist activities, are national parks. These and the natural parks are best suited to portray the issues of differentiating planning decisions on SPNTs in order to organise a nature conservancy regime, as well as exploit natural resources. For national and natural parks, one of the overarching objectives

is to secure recreational and tourist activities within SPNTs, which implies allotting specific plots of land for this purpose, as well as a differentiated regime of spatial protection, with due regard for their natural, historical/cultural, and other characteristic features.

In the areas of natural parks, various special protection regimes have been established, according to the ecological and recreational value of the natural areas. The following can be identified here: nature conservancy, recreational, agro-economic and other functional zones, including safeguarding zones for historical and cultural complexes and sites. Thus the list of the types of functional zones of natural parks is not exhausted by the law, and this category of SPNT makes it possible to effect more flexible planning of the protection and utilisation of lands within the protected area.

It should be noted that in future, for the development of an optimal network of SPNT in Russia, as well as for a general differentiation and utilisation of natural resources, the most promising option is the establishment of natural parks or biosphere reserves (this category of protected areas enjoys the greatest recognition in such countries as the USA and Germany), the basic characteristics of which are:

– the compact and limited character of the area;

– flexibility in management and spatial planning;

– the possibility for setting aside not only protection and improvement zones, but also the associated development zones;

– focus on the promotion of recreational and tourist activities.

The prime objectives of nature reserves include the protection of the area, scientific research, and public outreach. The latter type of activity, existing conflicts with the law notwithstanding, ultimately necessitates selecting specific zones and ecological routes within the boundaries of these strictly protected areas. The result is that various areas of the nature reserves differ markedly in terms of level of protection and utilisation.

The Law On SPNTs does not stipulate any division of the area of game refuges into areas with different regimes of protection and utilisation. Nevertheless, in accordance with the goals of this category of SPNTs, specially protected zones have been set aside within the nature reserves which are significant for sustaining the numbers of populations of protected species, such as wintering pits for valuable fish species, enclosed places for free keeping of birds, and mating-places for some bird species, etc. Moreover, some areas of nature reserves have traditionally been places of recreation and medical treatment for local residents, and the management of nature reserves has had to take this aspect into account: to identify some recreational places, and to make a record of areas of outdoor recreation.

Using the LP Tools in Zoning the Zabaikalsky National Park

Article 15 of the Law On SPNTs stipulate a possibility of setting aside different functional zones in national parks:

– A sanctuary zone, with a ban on any economic activities or recreational usage;

– A specially protected zone, within which conditions for the conservation of natural complexes and sites are maintained, and in which visits are strictly regulated;

– A zone of educational tourism intended for ecological education and familiarisation with the sites within the national park;

– A recreation zone designed for recreational purposes;

– A zone of protected historical and cultural sites, within which conditions for the preservation of these monuments are maintained;

– A zone for servicing visitors, intended for lodging places, tent camps, and other tourist service facilities, and cultural, routine and information services to visitors;

– An economic zone, within which economic activities needed to secure the functioning of the national park are carried out.

The area of the *Zabaikalsky National Park* in Buryatia is the most successful and appropriate as regards configuration and location, with an effective zoning framework and a corresponding spatial management. The forested area of 157,759 ha includes 69% of the total area of the forest reserves (230,177 ha). The park is contiguous to a protected zone set aside under the Ordinance of the Council of Ministers of the Buryat ASSR No. 123 of 14 June 1990, with an area of 64,400 ha, including 9800 ha in the on-shore area, and 54,600 ha of the surface area of Lake Baikal.

In the landscape planning system of the Zabaikalsky National Park (ZNP), the key mission of the planning organisation involves achieving the most effective and mutually coherent location – within the area – of the main recreation-economic, and cultural – historical and other sites, both protected and in use, with the purpose of establishing the most appropriate ecological modalities of their reciprocal functioning (spatial organisation of the Zabaikalsky National Park, 2002). The main elements of the landscape-planning structure of the Park are of the following types: point (planning centres), linear (planning axes), and area (planning zones). Depending on the ingredient elements, they can be natural and recreation-economic ones. The planning elements are also subdivided according to their economic, natural-resource and ecological significance, the planning and commissioning priority, the intensity and radius of influence upon the socioeconomic and natural environments.

Maps of the planning structure and functional zoning of the area, together with the maps of comprehensive assessment of the area by criteria of resistance (sensitivity and rehabilitation ability), significance (ecological and resource significance), and ecological risk, and with the maps of goals of sectoral and integrated spatial development, constitute a package of documents forming the basis for a landscape plan.

The definition of the goals of spatial development and management of the Park are carried out in reference to the planning elements of the area, with allowance made for the goal functions performed by the landscape. Also, spatial development is determined by a combination of the types of development goals (conservation, improvement or rehabilitation, and development), and of the types of measures on the exploitation of the landscape and sectoral target zones (abandonment of usage, or a zero variant, and extensive and intensive utilisation). The philosophy of such assessment is disclosed by the map of integrated goals of spatial development (Fig. 38).

The goals of spatial development are defined in the functional zones for landscapes or their components. At the stage of a landscape master plan, they are defined for all natural components and landscapes involved in the zone. At the stage of the landscape plan, the goals of spatial development are specified for individual landscapes and components. At the most detailed stage on the "green" plan, the types of goals are specified for forest quarters and their sub-quarters.

The types of goals of spatial development are defined as a result of comparing the indices of stability (sustainability), significance and ecological risk with the recommended modality of the functional zone. For landscapes with low stability, high ecological significance and high ecological risk in specially protected zones and in zones of educational tourism, extensive utilisation with the preservation of the existing ecological state is recommended.

For zones with stable and low-significance landscapes with intended uses as places of mass tourism, development may be intensive, with a significant transformation of natural landscapes. In disturbed areas, measures focus on improving the environmental condition. In areas with the status of reserves, with whatever the values of assessment indices, only conservation combined with abandonment of utilisation applies. Management of the Park according to nature conservancy priorities of action and measures, improvement of the ecological state and recreation and economic utilisation of the area is illustrated in Table 6.

The integrated goals of spatial development include the key actions and measures, and provide the management tool for the Park. The planning approach in the manage-

Types of goals / Types of measures	Conservation	Improvement (rehabilitation)	Development
	1	*2*	*3*
Abandonment of utilisation	***1a***	***2a***	—
Extensive utilisation	***1b***	***2b***	***3b***
Intensive utilisation	***1c***	***2c***	***3c***

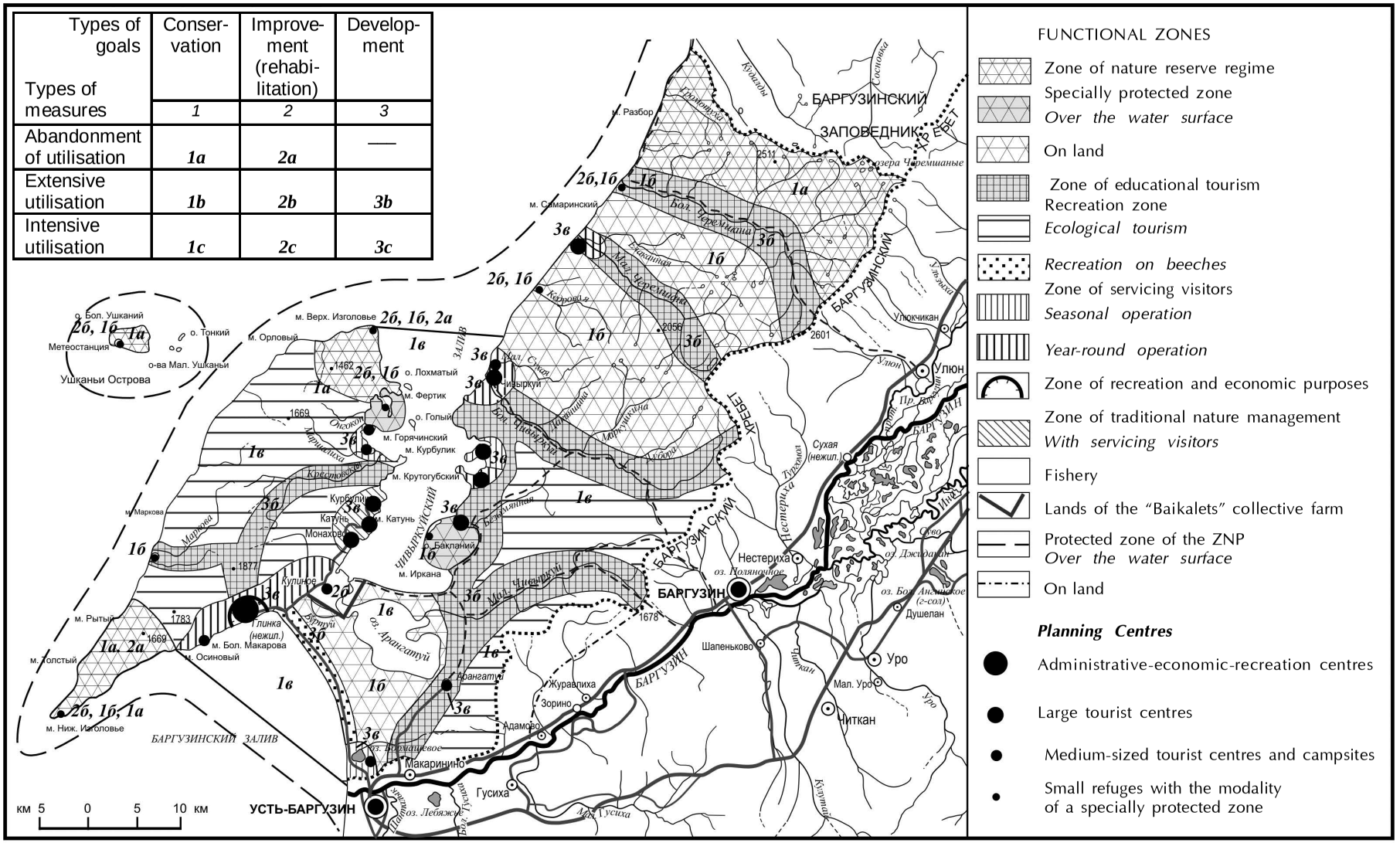


Fig. 38. Functional zoning and spatial development of the Zabaikalsky National Park.

Table 6. Schematic diagram of ZNP management at the stage of structural planning

Planning Elements	Management	
	Types of goals	Priorities of action and measures
Zabaikalsky National Park	Protection of unique natural sites and rational use of recreation resources in the middle part of the eastern shore area of Lake Baikal, with observance of ecological requirements for the central zone of the BNT. Formulation of the goals and methods of impact to achieve them, and setting up of organisational and landscape-planning structures of management, and a real-time control and monitoring system for the functioning of the Park as a managed site. Introduction of geo-information technologies.	
	Recreation areas	
Svyatonossky	Regulated intensive development and protection	Creation of the infrastructure for recreation services, and organisation of tourism and recreation
Chivyrkuisky	Regulated extensive development, rehabilitation, and protection	Protection and rehabilitation of the lake-swamp and coastal complexes, control of recreation oriented fishing, promotion of aquatic tourism and camping recreation
Barguzinsky	Protection and regulated extensive development	Setting up of green corridors and coastal recreation
Types of functional zones		
Reserve modality	Conservation plus abandonment of utilisation	Conservation in the natural state of the entire landscape complex, background monitoring
Specially protected zone	Protection, regulated extensive utilisation and rehabilitation	Conservation of natural eco-systems plus organisation of ecological and scientific-educational tourism. In the area of the Chivyrkuisky lake-swamp complex, observance of the water fowl sanctuary plus control of muskrat population, traditional fishing of commercial fish species
Educational tourism Zone	Regulated and intensive development and rehabilitation	Organisation/ implementation of ecological and scientific/educational tourism on main tourist routes with observance of allowable recreational impact on natural environment, with specially set aside observation points, lodging places, and fishing areas.
Recreational zone	Extensive development	Organisation and implementation of short- and long-term recreation with the most favourable combination of recreation resources in traditional recreation places, planning and recultivation efforts to increase the recreation capacity of the area
Zone of year-round services to population	Regulated utilisation	To receive, accommodate and service residents of year-round recreation, with the construction of permanent tourist service facilities, and information and communication services. Creation of an artificial recreation environment.
Zone of seasonal services to population	Regulated intensive development and rehabilitation	Creation of the conditions for comfortable recreation plus organisation of tent camps and campsites. Nature conservancy measures focus on maintaining biological sustainability and conservation of the ecological value of natural communities
Recreational-economic utilisation Zone	Intensive development	Includes land intended for the central area of the national park itself and for servicing visitors. Creation of the main recreation centre of the Park in the community of Glinka
Traditional nature management Zone: a) with services for visitors	Regulated intensive development and rehabilitation	Involvement of the community in the work in the Park
b) Commercial fishing	Regulated extensive utilisation	
Protected zone	Protection, regulated extensive utilisation and rehabilitation	
Types of point and area sites		
Campsites and tourist places for short-term rests		Extensive development and rehabilitation
Tourist and sports-fishing camps for long-term rests		Intensive development and rehabilitation
Forest ranger stations and forestries		Supervision and protection
Weather stations		Preservation of current utilisation and protection
Natural and historical/ cultural heritage monuments		Protection and regulated utilisation

ment system makes it possible to decide on the measures of impact and monitoring, and to consider the variants of decisions regarding their advisability and feasibility in a given geographical setting.

7.5. THE SOCIO-ECONOMIC GOALS OF LANDSCAPE PLANNING

Among the final stages of landscape planning is the application and integration of results obtained in plans of socio-economic development of the areas. This stage involves switching to another qualitative level of implementation of new theoretical and practical technologies in the economic and social development of municipal districts.

The current importance of these efforts is dictated by an expansion of the rights exercised by the regions, and by the increase of the role played by self-organisation, self-financing, and self-government which entail a need for the scientific and practical provision for these processes. In connection with what has been said above, concepts, forecasts, projects, and goal programmes of balanced development are becoming a "must". There has emerged a demand for comprehensive research into regions, rationales for the concepts of their sustainable development, and for programmes on removing particular regions from their depressive state.

Balanced development of any area is determined by a combination of socio-economic and natural-ecological factors. Disregarding any one of them would lead to an imbalance and disturbance of the process of development. For areas of high natural value, compliance with ecological requirements is mandatory. In this context, at the contemporary stage of the development of the social and ecological system, of special significance is becoming the concept of strategic, coherent, landscape (ecological) and socio-economic spatial planning. This concept focuses on achieving the goal to regulate the conflict economic and social interests – ecological constraints of the area.

The underlying tasks in this case are:

– Modelling of balanced resource utilisation;

– Development of the vehicles for coordination of actions focused on optimising the relations of social and natural systems (normative-legal regulation of ecologically oriented land use);

– Attainment of a balance of national interests, and searching for new (alternative) resources for development of areas (distribution of income from the utilisation of natural resources);

– Prospects for the implementation of experiences in strategic landscape (ecological) and socio-economic planning in model regions or municipal districts of the RF;

– Provision of scientific information to the authorities of the territories via educational and procedural materials.

The municipal district is the primary level of spatial management. It also represents a complicated spatial natural-economic system, the development of which is largely determined by the degree of maturity of intra-system integrative links between the natural, economic and social environment, and the authorities. An analysis of the patterns of spatial development enables a perspective and diagnosis of the response of district-level systems and their elements (rural communities, sectors of the economic complex, etc.), to prevent impacts from the combined economic environment. Therefore crisis situations can be forecast, and hence measures taken to eliminate them, which is in turn one of the adaptation tasks of managing spatial development.

Spatial planning of balanced development is structured in accordance with the aforementioned generally accepted principles of spatial forecasting and is based on compliance with the following stipulations:

– General characterisation of the district. This includes an assessment of the economic-geographical standing of the district, a list of technical/ economic indices

characterising the rank of the district in the federal entity, and the overall standing of the social and economic spheres of the district.

– Analysis and assessment of the natural resource, labour and productive potential, the level of involvement of the productive forces and their utilisation, a characterisation and assessment of the level of development of the social and engineering-transportation infrastructures, and a landscape-ecological assessment of land use.

– Development of sectoral and comprehensive maps reflecting the input conditions, potential, investment attractiveness and prospects of economic and social development and management of the area.

– Preparation of a strategy of socio-economic development. This block includes devising possible scenarios of socio-economic development of the districts, and recommendations for reconciling the sectoral strategies: development of agriculture and industry, investment, the social and technical aspects of transportation infrastructure, land relations, and rationalisation of local budgets and financial flows.

The methodological and procedural approaches to integrating landscape and socio-economic planning of spatial development were tested against the Pereslavl municipal district of the Yaroslavl region. The basic spatial-information cells in those efforts were represented by rural communities of the district. The relevant illustrative cartographic documents include three main blocks, which reflected the input conditions, the potential, the investment attractiveness, and the prospects of economic and social development and management of the area in question (Fig. 39).

Block 1: Diagnostic

Map: "Socio-Economic Input Development Conditions Pereslavl Municipal District, Yaroslavl Region", insert maps "Population and Labour Resources", "Development of the Social Sphere", "Ecological Situation", and "Recreation Potential". This includes the following ingredient elements with a detailed representation of factual material:

Infrastructure: Functional zones of social and transportation infrastructure: administrative boundaries, transportation routes, agricultural lands, forest reserves, and lands with use constraints (ecologically unfavourable areas, protected zones of the Lake Pleshcheyevo National Park, and others);

*Economic:*Level of development of dominant and complementary sectors of the spheres of material and non-material production of the economic complex under the jurisdiction of rural communities, main mineral deposits, forest utilisation, structure of agricultural lands;

*Social:*quantitative and qualitative potential of resident population, percentage of population of employable age, distribution of working age population in the sectors of the economy, educational level of population, distribution of total expenditures connected with the social sphere, etc.;

Ecological: Lands with constraints on use (water-protection zones along the rivers and round the lakes, and sanctuaries), Lake Pleshcheyevo National Park, and ecologically unfavourable areas (waste dumps, burial of dead livestock, storage areas for pesticides, etc.).

Block 2: Analytical

Schematic map of the Pereslavl Municipal District. Socio-economic potential and investment attractiveness of the area" (Fig. 40). This is based on an analysis of the natural, economic and social input conditions of the area, which is classed as a rural community according to the indices of development potential and investment attractiveness of the area. Highlighted are the promising development priorities of agriculture, industry, social sphere, and the sphere of rural communities.

Block 3 – Predictive

Goals of Development Map (Fig. 41): The municipal district was zoned on the basis of the priority objectives and goals of strategic planning of spatial development. The map

Legend to Fig. 41

Areas	Rural Communities	Goals of Development
a	Zagorievskaya, Dmitrievskaya, Kychenskaya	A further specialisation of the forest and woodworking industry, development of small-scale processing in the beef and dairy industries, and of tertiary industry, and quality modernisation of the road network.
b	Nagorievskaya	Expansion of the network of commercial facilities, setting up of the municipal educational complex, reconstruction of the existing community centre.
c	Andrianovskaya, Kopninskaya	Promotion of recreational activities, with revised system of rent payments for garden plots. Construction of a motor workshop. Development of food processing: reopening dairy purchase and vegetable and seed processing centre. Improvement of road infrastructure.
d	Kubrinskaya, Kupanskaya, Veskovskaya	Mining of minerals and milled peat, and construction of a plant to manufacture building blocks. Comprehensive nature conservancy measures with concurrent promotion of recreational activities (sport hunting & fishing, ecological and natural tourism) within the national park and the sanctuary. Opening of the medical air station. Expansion of the public catering network and commercial facilities. Improvement of road infrastructure.
e	Pereslavl-Zalessky	Industrial-recreational activities with promotion of excursion-educational, convention and religious tourism.
f	Glebovskaya, Dobrilovskaya, Skoblevskaya, Berendeyevskaya	Installation of gas service in residential areas, construction of the dike, improvement of the area for recreation purposes, reconstruction of the sports-fitness complex. Modernisation of the winery.
g	Aleksinskaya, Lyubimtsevskaya, Smolenskaya	Organisation and modernisation of existing enterprises specialising in cereal and milk processing. Expansion of commercial and purchasing enterprises. Comprehensive development of the recreation resources. Construction of community-recreation centres
h	Troitskaya, Perelesskaya, Dubrovitskaya, Ryazantsevskaya, Ponomarevskaya	Setting up of the plant for the manufacture of household chemicals using imported feedstock. Setting up of the enterprise for the manufacture of building materials (brick and concrete blocks) using existing deposits of sand and gravel mixture, clay, and molding loams. Production of saw timber. Expansion and modernisation of existing mini-bakeries. Creation of the motor workshop. Construction of the community centre, and the library. Reconstruction of the pollution control facilities.

Axes of Development:

i - Order I. Pereslavl – Smolenskoye. About 40% of the socio-economic potential of the Pereslavl Municipal District is concentrated here. This zone will also provide the basis for balanced development of the district through intensive use of the existing mineral-feedstock and recreation resources, and the development of agricultural production and elevant servicing centres.

j - Order II. Pereslavl – Novoye, and Pereslavl – Pereleski. About 30% of the socio-economic potential of the Pereslavl Municipal District is concentrated here. The role in the district's economy will be enhanced through integrated use of the recreation resources and the conversion of the sectors of the agro-industrial complex to output products to render services to tourists.

k – Order III. Pereslavl – Svyatovo – Nagorie. About 10% of the socio-economic potential of the Pereslavl Municipal District is concentrated here. The promising line of development involves an enhancement of the transport links of the administrative district centre with the north-western periphery, and an intensification of agricultural production and relevant servicing sectors.

shows the leading economic axes and traffic directions of commodities and raw materials envisaged as remaining the decisive basis for balanced development of the district. The results were used to develop a variant for improving the management system for the municipal district through a consolidation of rural communities, reducing their number from twenty-one to eight, according to the priority goals of development. This would enable the rural community to rationalise the local budgets and coordinate financial / investment flows.

Thus the outcome of integrating the goals of landscape and socio-economic planning of spatial development is the development of the most appropriate strategy for optimising the management system and, hence. Spatial organisation of the municipal districts.

7.6. URBAN PLANNING

General

At present, urban planning efforts consider the ecological and natural characteristics of the areas occupied by human settlement and focus on the creation of favourable living conditions, with the nature management processes and environmental protection processes regulated. These efforts are concurrent with addressing the issue of sustainable development of human settlements, as well as of the areas between settlements, including measures for reducing harmful impacts of economic or other activities on the natural environment, and their utilisation in the interests of the present and future generations (Urban Planning Code, 2004). Such an approach is also characteristic for district-level planning efforts, where a tightening of ecological standards is now seen as important (Brade, Pertsik & Pitersky, 2000).

This is in keeping with the general goal of landscape planning, i.e. the quest of ways to reach higher living standards while preserving the natural environment, and maximum harmonisation of human society and nature through optimal spatial management.

The spatial structure of the urban area and surrounding space should be treated in a polarised landscape: on the one hand, it represents a maximally urbanised area; on the other, it is the surrounding natural environment that exists by natural laws. Landscape planning and related to problems of society-nature interaction thus involve examining local structures – particular environments – and making a maximum contribution to achieving the formulated general objectives.

A case in point may well be provided by the landscape planning programme for the town of Baikalsk that was launched by the Institute of Geography SB RAS.

The town was founded in 1966, around the large Baikalsk integrated Paper-and-Pulp Plant (BPPP), which remains the basis of its economy today. The site selection on the Lake Baikal shore was dictated largely by economic and contingent considerations. Baikalsk has retained its high production potential to the present. Of 17,000 residents of Baikalsk, 3400 are employed in the plant. They account for 0.6% of the Irkutsk region's population, but nearly 1.5% of its industrial output. This high industrial potential notwithstanding, the town is officially an urban area under jurisdiction of the Irkutsk region.

To the south, the town is surrounded by the arms of the northern macroslope of the Khamar-Daban range; Lake Baikal lies to the north. The town with its industrial area is situated on the gently sloping piedmont Utulik-Salzanskaya plain, by deposits of weak material from the surrounding mountains. Friable deposits consisting of boulders and gravel-shingle-like material with sand and loam, are as thick as several hundred meters. The town's residential area lies four kilometres west of the BPPP, near the outlet of the Salzan and Kharlakhta interfluve. At present the surface area within the city limits is 3144 ha, with 52.4% of this area occupied by urban development, including the industrial area and main traffic arteries,. The rest is occupied by forests and woodland parks, garden areas and other areas.

The town has no compact core, as it alternates between woodland and built-up areas. The residential area consists of three *microrayons*, two of which evolved out of workers' settlements built in the early part of the construction of the integrated plant. The microrayons are separated by forested areas near the outlets of mountain river valley. They include flat and piedmont-plain complexes, with the vegetation subject to disturbance of different extents. Natural primitive structures have been largely preserved, with their dark-coniferous taiga forest surrounded by mountains.

These micro-rayons are comparable in area with three other areas which are of vital importance to the community. They include vast expanses of garden plots. One of the largest clusters of horticultural cooperatives has emerged near the settlement of Salzan, the other spreads along the motor road to the west of the settlement of Stroitelei; and the third lies in the piedmont area to the west of the residential area.

The town's natural environs comprise landscapes with relatively extensive diversity of natural resources, but the location in the central ecological zone of the Baikal natural territory as stipulated under the federal law "On the Protection of Lake Baikal" is virtually within the zone of the protected area that provides a buffer for the conservation of the lake's ecosystem, where the natural complexes maintain the quality of the lake's unique fresh water, and place constraints on a further increase in economic activity, as large-scale development of natural resources is impracticable. For the same reason, there are no conditions for a rapid, efficient exploitation of the potential of social and engineering infrastructure in order to promote a recreational complex of scale. Against all the odds, the recreational potential of the area is rather high.

Thus, one of the key issues for the further development of the town is a decrease of all forms of anthropogenic stress affecting, primarily, the Lake Baikal water quality.

Other key factors for the existence and development of the town include such possibly hazardous natural processes as debris slides, high snowmelt water in the rivers, and avalanche hazards in the immediate vicinity, as well as high seismicity (up to M9).

Obviously, the general problems could be resolved by identifying the particular problems, i.e., by defining the urban and suburban zones and the nature conservancy, including water protective, potential of the natural structure that has persisted to date; through biodiversity conservation; and through appraisal and avoidance of hazardous exogenous processes. Even without touching on the town's economic and socio-demographic problems, the spatial aspect of the setting of the above problems has a bearing on the prospects for spatial development in general.

Preparation of a Landscape Plan

The first phase of planning involved formulating the following objective: with a system of scientific information and analytical procedures used to support of comprehensive ecological research, a package of water-protection measures and integrated functional-ecological zoning of the town of Baikalsk together with its immediate surroundings was carried out, based on assessment and analytical maps at a scale of 1:10,000, and 1:25,000. Furthermore, it was planned to define the goals of spatial development for the zones thus set aside, using landscape planning technology and adhering to existing normative-legal ecological constraints under federal and regional law.

The information basis for the programme was provided by published, archival and statistical material and data on environmental conditions from various agencies, primary survey data for the construction of urban facilities, comprehensive research findings (primarily from the Institute of Geography SB RAS) for the urban surroundings, as well as ongoing additional comprehensive ecological investigations into environmental conditions for both the town and its surroundings.

Landscape planning and water-protection zoning approaches based on inventories of the state of natural and transformed geo-systems and their elements were used, and provided a functional definition for these systems. The zoning effort took the current util-

isation of the area into account: its industrial-residential and sanitary-protection infrastructure, which holds promise for socio-economic development. The assessment of the area was based on comprehensive characteristics, including landforms, soil, vegetation, and moisture content. Surface and subsurface water and atmospheric conditions were analysed. Possible hazardous exogenous processes were assessed.

The efforts undertaken during the first phase comprised the following stages:

– A comprehensive ecological survey, collection and systematisation of available information about the area, preparation of the foundations and classifications of characteristics for particular environments, and development of legends to thematic maps and their author's originals;

– Ecological zoning of the area for various natural components (vegetation, soils with underlying substrate, surface and subsurface water; atmospheric air; comprehensive ecological zoning);

– Definition of the development goals for the identified ecological zones, recommendations for nature conservancy measures.

The range of problems related to the urban area and the quest for ecologically acceptable development paths are treated in the context of assessing the state of major natural components, or "information strata" about natural conditions.

As the area has uneven coverage for the data necessary to characterise particular components, some of the maps were produced using proxies and existing links between characteristics of the natural components. These maps for integral development goals for the area are based on mutually complementary information for various natural components. However, priority was given to those of spatial development goals for surface water and the biota which constitute the major environment-shaping functions.

The resulting sequence of cartographic documents included the following maps:

– Engineering-geological conditions (1:50,000);

– Subsurface water depths (1:25,000);

– Conditions for hazardous exogenous processes (1:25,000);

– Microclimatic potential of atmospheric self-cleansing (1:50,000);

– Pollutants concentration in the ground-level air layer (by year, February, May, August, and December) (1:75,000);

– Water permeability and sorption capacity of soils (1:25,000);

– Categories of "significance" and "suitability" of soils in forest and agricultural areas, and their water-protection significance (1:25,000);

– Self-cleansing potentials of surface and subsurface water; degree of protection against contamination and pollution (1:25,000);

– Spatial development goals for surface water (1:25,000);

– Biotopes and spatial development goals for vegetation (1:10,000, and 1:25,000);

– Natural-spatial complexes (synthetic, fractional spatial differentiation of structural components, preliminary map, 1:25,000);

– Infrastructure of the area, and types of surface pollution and contamination (1:10,000, and 1:50,000);

– Present land use: categories of lands, sanitary and sanitary protection areas (1:25,000);

– Areas of social load on the area (e.g. availability of communal facilities; availability of educational and preschool establishments (1:25,000);

– Integrated spatial development goals (1:25,000);

– Integral zoning according to the types of main measures (1:50,000).

The set of schematic maps and the concurrent substantive thematic analysis was dictated by the need to identify the water-protection potential of the area, and of the spatial development goals, the preservation conditions of existing biodiversity and critical scenic properties of the area, and the conditions for human life and activity, with a prior assessment of the load on the area.

The resultant material for analysing the problems facing urban development was provided by combined spatial development of surface water and biota maps, as well as by two integral maps featuring a still higher level of generalisation: integrated goals of spatial development, and integral zoning according to the types of main measures.

The map titled "Integrated Spatial Development Goals" was generated through a comparison of the entire set of information prepared as part of project implementation (Fig. 42). The structure of derivation of the final integral maps is a pyramid, the base of which is formed by detailing the inventory stage according to the particular environments, with an assessment of their state and significance.

The existing nature conservancy legislation, even without the law "On the Protection of Lake Baikal", and particularly the water and forest legislation, places most lands of the area into the category of environmental-protective areas, and regulates the economic activities, which are dictated by the complexity and diversity of the mountain-taiga conditions. The result is a spatial environment-protective structure that is also reflected in schematic maps of spatial development goals for particular environments.

When generating the resulting map for integrated goals, with the priority goal of the protection of Lake Baikal in terms of the "conservation" category, it was necessary to first take into account the findings obtained from goal-oriented zoning of water, where the priorities were assigned to the quality of runoff and flow formation. Here, the groundwork was laid for such principles as conservation and rehabilitation of spatial mosaic pattern with environment-shaping cores, which have preserved the most in contemporary conditions of the complexes. Sustenance and recovery of such a structure requires rehabilitation measures, primarily in areas adjacent to the residential and industrial zone. Such natural "cores" must also be enhanced towards Lake Baikal, as is the case with the anthropogenic centres, the micro-rayons. What is in fact needed is to generate a micro-structurally polarised landscape with its inherent and derivative states at a large scale, up to the level of separate areas. To implement the identified categories of integrated goals of spatial development, priority areas of action and measures were suggested.

The schematic map shows the boundaries for

– The Lake Baikal shore protective strip and for its WPZ (they are specified "normatively", yet where the urban infrastructure and industrial zone approach the lake, they have a projective character);

– The central ecological zone of the Baikal Natural Territory, as defined in the federal law "On the Protection of Lake Baikal", 1999, whose outer boundary runs along the nearest watersheds (Ecological Zoning of the Baikal Natural Territory, 2002.

– The calculated boundary of the range of snow avalanches with 2% probability;

– The city limits proposed by the district committee for land resources and land organisation; and

– The city limits proposed by the town administration.

These boundaries, like the "significance" and "sensitivity" ratings, the development goals of separate natural environments (primarily, priority ones); and the current exploitation of the area were all considered in drafting the integrated schematic map.

Using the entire body of cartographic information reflecting the characteristic properties and present status of the area, the boundary of the natural zone has been tentatively delineated. According to the Land Code (2001) and to the Urban Development Code (2004), suburban zones can include lands beyond the city limits which constitute, togeth-

Legend to Fig. 42

Integrated goals of spatial development town of Baikalsk, and suburban zone

PRIORITY AREAS OF ACTION AND MEASURES

RETENTION OF PRESENT STATUS/UTILISATION	
Conservation plus abandonment of utilisation	
1	LOCATIONS OF RARE PLANT SPECIES (OF CATEGORY I) Aconitum sukaczevii Steinb., Tridactylina kirilowii Turcz Arrangement and observance of reservation regime in habitats of rare plant and animal species. Identification of locations of rare plant and animal species on the urban area and in the surroundings. Organising ecological-educational activities focusing on rare species protection.
Conservation plus abandonment of separate kinds of economic utilisation	
	CONSERVATION WITH STRICT REGULATION OF ACTIVITIES ON THE AREA / ABANDONMENT OF USES THAT LEAD UP TO DISTURBANCS OF NATURAL COMPLEXES AND THEIR LANDSCAPE-STABILISING FUNCTIONS
2	In the Lake Baikal Shore Protection Zone. In places of formation and manifestation of hazardous exogenous processes: valleys and adjacent hillsides of mountain rivers with debris-flow channels, areas with local and group wash events, and potential debris-flow masses (areas of potential debris-flow formation)
3	Formation of plantations with high environmental-protective properties. Main forest utilisation ban, regulated and monitored rehabilitation felling, monitored collateral forest utilisation. Monitoring of the state of the area, conventional nature management under supervision, management of recreational activities plus infrastructure for tourist routes. Monitoring of clearing for power transmission lines, the federal railroad and motor road area under supervision and of the state of the road-protective infrastructure, maintenance of protective facilities in good condition. Measures focused on bank protection, protection against debris flows, and slope reinforcement, especially near residential areas. Organisation of recreation places and of the local road infrastructure in the coastal-protection zone of Lake Baikal. Strictly regulated scientific-educational ecological route tourism, infrastructure of the routes with the provision of safety and campsites, limitation on the total area of the trail network.
	RETENTION OF LIMITED UTILISATION WITH LOCAL FOCI OF SPECIAL REGULATION OF NATURE MANAGEMENT
4	LOCATIONS OF RARE PLANT SPECIES (OF CATEGORY 2) Aegopodium latifolium Turcz., Orchis militaris L., Galium paradoxum Maxim., Arsenjevia baicalensis (Turcz. Ex Ledeb.), Rhynchospora alba (L.), Listera cordata (L.), Polystichum lonchitis (L.).
5	Water-protection zones of the rivers and of Lake Baikal
6	Natural complexes of significance for quality formation of surface and subsurface water and its protection, preserving structure similar to naturally occurring one, areas with potential avalanche hazards caused by the elimination of vegetation cover, as well as with active slope processes. In water-protection zones: Conservation and monitoring of the area. Formation of natural structure and integrity of natural complexes with natural landscape-stabilising functions, limited utilisation by tourists and collateral forest utilisation. Conservation and monitoring of natural complexes. Measures focusing on protection and reproduction of forests, including valuable flora and fauna, provision of forest-pathological surveys, formation of plantations with high environment-shaping functions, regulated hunting and supervised collateral forest utilisation on the area. Regulated traditional forest utilisation near human settlements. Identification of specially protected areas with rare and valuable plant and animal species. Regulated tourism. Creation of the conditions and organisation of regulated recreational activity. Development of the recreation infrastructure. Ecological and mountain tourism with the necessary infrastructure of trails (limitation of the total area of the trail network), campsites, and provision of route safety.

Extensive utilisation	
7	CONSERVATION OF PRESENT UTILISATION / STATE
8	LOCATIONS OF RARE PLANT SPECIES (OF CATEGORY 3) Montia Fontana L., Waldsteinia ternate (Steph.), Trifolium montanum, Fritillaria dagana Turcz. ex. Trautv. Conservation and monitoring of the integrity of natural complexes. Conservation of the natural course of evolution of forests and of their landscape-protective functions. Measures for protection and reproduction (including special-purpose forest-pathological surveys). Biodiversity conservation of flora and fauna. Ban on main forest utilisation in the central and buffer zone of Lake Baikal. Extensive regulated collateral forest utilisation: hunting (monitoring of commercial animal populations), gathering of nuts, berries and wild plants. Continuation on the area of the kinds of traditional forest utilisation. Creation of the conditions and organisation of regulated recreational activities, ecological-educational activity. Ecological mountain tourism with the necessary infrastructure of trails and campsites, provision of route safety, identification of interesting natural sites. Promotion of hunting/fishing tourism.
DEVELOPMENT OF THE EXISTING AND PLANNED UTILISATION	
9	DEVELOPMENT OF THE AREA WITH REGULATION OF THE KINDS OF ACTIVITY ACCORDING TO NATURE CONSERVANCY LIMITATIONS Formation of spatial structure of plantations with high environment-protective properties. Monitoring of natural complexes on the area. Hunting, extensive collateral forest utilisation: gathering of nuts and wild-grown fruits. Extensive development of ecological and mountain tourism. Setting aside areas for recreational development, including the construction of tourist centres, and promotion of the winter kinds of recreational activities. Promotion of hunting and fishing tourism.
10	DEVELOPMENT WITH IMPROVEMENT OF DISTURBED LANDS AND LOCAL CONSERVATION OF HIGH SENSITIVITY COMPLEXES In forest reserves: Measures promoting an enhancement the water-protective, environment-shaping and recreational functions of forests around linear infrastructures, favouring development of collateral forest use. Amateur hunting. Control of clearing of strips for power transmission lines, and of amelioration of lands adjacent to road embankments. Promotion of hunting and fishing tourism coupled with hiking and fitness recreation. In the area of the town: Planting of trees and gardens. Measures for enhancement of water-protective, environment-shaping and recreational functions of plantations around linear infrastructures.
11	DEVELOPMENT IN ACCORDANCE WITH TYPES OF ACTIVITY Development of the urban and industrial areas. Mosaic conservation of natural complexes. Infrastructure development for tourism. Forestry: Creation of plantation structures with high environmental-protective functions. Hunting of all species, extensive collateral forest utilisation. Monitoring of natural complexes, including forest-pathological surveys. Development of the tourist infrastructure. Extensive development of ecological and mountain tourism. Setting aside areas for recreational development, promotion of winter recreation. Creation of the conditions for hunting, fishing and gathering tourism.
IMPROVEMENT	
12	Rehabilitation of the area in the coastal-protection zone of Lake Baikal. Renewal of the quasi-primary structure of natural complexes, and conservation with strict regulation of activities in the area.
13	Water-protection zones of rivers with little rehabilitation to native/natural condition and of their runoff and flow regulating and forming functions. Rehabilitation and monitoring of the supervised area of the federal railroad and motor road, and power transmission lines. Maintenance in good condition of the road-protection infrastructure of linear facilities that cross the said zone. Rehabilitation and monitoring of water-protection zones adjacent to housing estates, garden-plots, and to the industrial area.
	COMPREHENSIVE REHABILITATION AND ENGINEERING-INFRASTRUCTURE FACILITIES
14	Microrayons and human settlements
15	Industrial area
16	Area of special focus of rehabilitation measures, including technological solutions to increased mineralisation of groundwater due to production activities. Monitoring of the area. Planting of trees and gardens to provide mosaic structure for plantations of local species. Organisation of measures focusing on waste disposal and waste water treatment.

17	Organisation of areas for dacha cooperatives and their surroundings – cleaning of the area, regulation of utilisation of mineral fertilisers and pesticides.
18	IMPROVEMENT OF DISTURBED AREAS, FOLLOWED BY ASSIGNMENT TO THE CATEGORY OF DEVELOPMENT Recultivation to produce complexes with material balances natural for the area. Formation of structure of highly productive plantations, promotion of reproduction of valuable forest-forming species, sanitary-hygienic monitoring, and acceptable collateral forest utilisation.
	IMPROVEMENT OF LOCAL AREAS with concurrent recultivation efforts:
19	Areas disturbed by geological survey, and for used quarries
20	Local-focal pollution and contamination with household solid waste (HSW)
21	Identified areas with HSW from garden plots
22	Wood waste disposal areas for
23	Areas of diffused pollution
24	Areas polluted with HSW
	Shores of Lake Baikal requiring monitoring and reinforcement:
25	Abrasion;
26	Abrasion-accumulative;
27	Technogenic
BOUNDARIES	
28	Coastal-protection zone of Lake Baikal
29	Water protective zone of Lake Baikal
30	Central ecological zone as per the law “On the protection of Lake Baikal”
31	Boundary of the 2%-availability snow avalanche advance range
32	Urban line as suggested by the District Committee for Land Resources and Management
33	Urban line as suggested by the City Administration
34	Boundary of the prospective suburban zone
Additional designations:	
35	Mudflow channels
36	Motor road of federal significance
37	Power transmission line
Proposals for organization of specially protected territories	

“UTULIK-BABKHINSKY” - district-level **natural recreation-ecological park**, with a complex of typical mountain-taiga geosystems. Rare plants.

Unique water sites. Natural monuments. Popular place for mountain and ecological tourism. Accessibility for recreationalists.

Micro-zapovedniks in conservation areas of first protection category plant species (Aconitum sukaczevii Steinb., Tridactylina kirilowii Turcz).

ORGANIZATION OF MEASURES AND ACTIONS, AND CONTROL OVER THEIR PERFORMANCE

The Natural Resources Committee for the Irkutsk region, the Irkutsk Forest Administration, and the Administration for Protection and Rational Utilization of Hunting Resources

The Regional and District Committees for Land Resources and Management, the Natural Resources Committee for the Irkutsk region, the Regional and District Administration for Agriculture, and the Administration for Protection and Rational Utilization of Hunting Resources – on agricultural lands and land reserves

The District, City, Urban and Village Administrations – for the territory under their jurisdiction and in the suburban zone

Water Resources Administration of the Irkutsk region, and the State Inspectorate for small vessels of the Irkutsk region – on water bodies

The Irkutsk Territorial Administration for Hydrometeorology and Environmental Monitoring, and the State Motor-Vehicle Inspectorate of the Administration of Internal Affairs of the Irkutsk region and District – for all air pollution sources, filling stations and parking lots

Western-Baikal Inter-District Procurator’s Office – for all kinds of pollution of the territory

Regional Division of the All-Russia Society for Protection of Historical and Cultural Monuments, and the Regional Council of the All-Russia Society for Nature Conservation

District Center for Sanitary and Epidemiological Surveillance, and the Station for Animal Diseases Control – for all territory

Tourism Department of the Regional and District Administration – measures for the development of the recreation infrastructure, and ecological-educational activities

Specially authorized district environmental protection agency

Administration of JSC “Baikalsky PPP” on the territory under its jurisdisction, and on the adjacent territory

er with the town, a common administrative, natural and economic area. This area is divided into areas of agricultural production, recreation, reserve lands for urban development, open free space with sanitary, sanitary-hygienic and recreational functions, where economic and other activities are prohibited, if they adversely affect the environment. The boundaries and legal regime of the natural zones are approved and amended by the laws of the entities of the Russian Federation.

Based on the first integrated map coupled with further material, it was possible to draft the schematic map titled "Integral zoning according to the types of major measures". A total of nineteen areas were identified for the entire territory, with an outline of the development goals, and a general description of the natural structure and its modification under human influences (geographical localisation). The areas thus identified were used to define the array of action and particular measures necessary to achieve the spatial development goals for each area.

The landscape planning project that has been implemented is tied to the landscape master plan effort undertaken by the Institute, focusing on the Slyudyanka district, at a scale of 1:200,000. On the other hand, building the urban infrastructure facilities will require a still more detailed definition of the differentiation of the spatial properties (at a larger scale, perhaps 1:2000), primarily for the purposes of giving priority to environmental concerns.

The findings thus obtained serve to maximally assess the properties of spatial resources, their nature conservancy potential, and the prospects of possible uses and can be used in urban development functional zoning of the area.

7.7. ENVIRONMENTAL IMPACT ASSESSMENT FOR PLANNED PROJECTS

General

Landscape planning methods and relevant results can be used in environmental impact assessments for the following purposes:

– Site selection for projects and comparative assessment for various siting options;

– Comparative integral assessment of the particular type of impact (or of the consequences of implementing design projects in general) for some or all environmental components, and

– Comparative assessment of the results on the operation of the project over various time intervals.

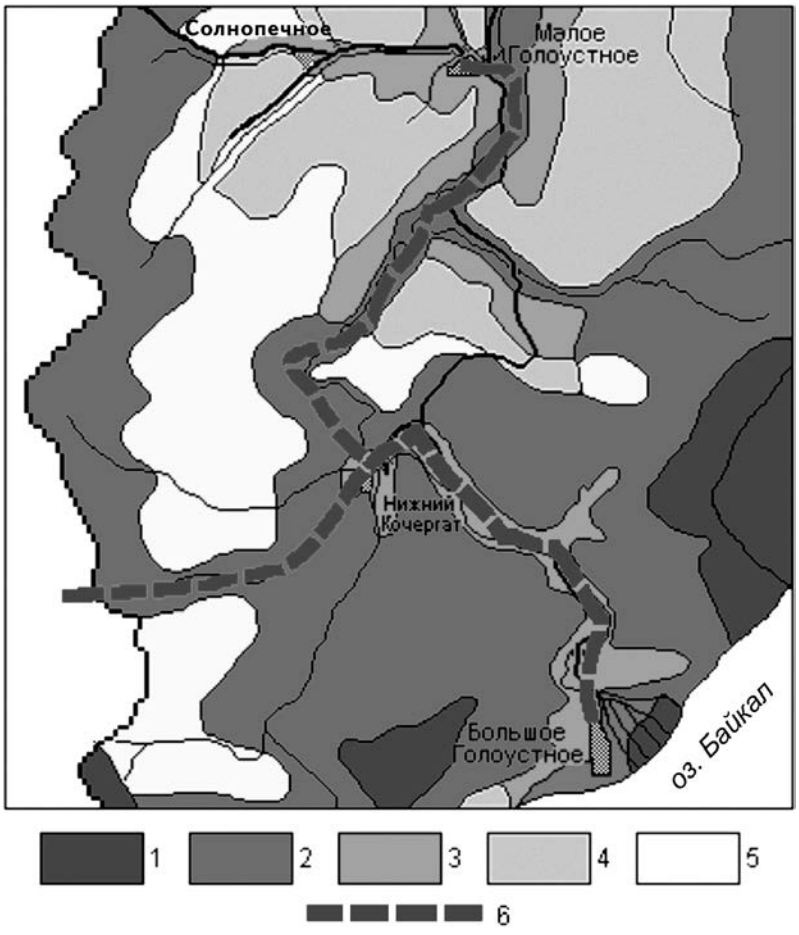
The procedures used in addressing these objectives are based on landscape planning techniques, and have an identical methodological framework. Therefore, the use of these techniques will be exemplified here in connection with the problem of substantiating the particular site selection for a project, as is typical of the EIA process. Here, two approaches must be distinguished:

– For areas where landscape planning has been implemented as one of the forms mentioned in previous sections (landscape programme, landscape master plan, landscape plan), and

– For areas where no landscape planning has been carried out.

With landscape master plans or landscape plans, it is a much easier matter to provide the substantiation for site selection for a project. In this case the initial variant of site selection (platform or linear facility route) implies a place within the zone of predominant development of area utilisation on the map of integrated goals of spatial development or on the map of priority areas of action and measures, if the kind of activity under consideration was foreseen by the landscape plan.

The linear structures that present no serious ecological problems or conflicts in land use (low-voltage power lines, communications lines, etc.) can be located in the retention



1 – abandon utilisation;

2 – retain sustainable extensive utilisation or assignment to this category;

3 – develop extensive utilisation;

4 – improve (rehabilitate), followed by assignment to extensive utilisation;

5 – improve (rehabilitate), followed by abandon utilisation;

6 – corridor for the projected power line.

Fig. 43. A portion of the map of spatial development goals as a part of the landscape structure plan with the corridor for the projected power line.

of existing utilisation zone. An example for selecting the route for a power line on the existing landscape structure plan at a scale of 1:200,000 is shown in Fig. 43.

If there is no landscape plan for the area to implement a particular project, the methodological practices used in landscape planning to summarise and compare heterogeneous information about the various natural components and for comparative assessment of the area, is used. Furthermore, the site selection technique involves the following steps:

- Defining the list of natural and social components for which an assessment of site selection is to be made,
- Assessing the level of conflict for the area for each selected component in terms of the category of significance and (or) sensitivity,
- Deriving an integral characteristic for the area in terms of the level of its conflict with the intended use,
- Making the "best siting choice" in relatively conflict-free parts of the area.

"Relatively conflict-free" meant areas in which:

- the modality of utilisation is not limited by existing legal and normative rules in respect to planned type of activity; and
- current utilisation is not in conflict with the planned kind of activity, or can be combined with it via a set of compromises and compensations.

Defining the List of Components for which Site Selection Assessment Should Be Made

The level of conflict of the area is assessed for a definite list of natural and social environmental components. This list should include all components which might be directly or indirectly affected by the project. It is necessary to ensure that:

– The composition and internal structure of the components are thematically uniform;

– Definite criteria amenable to assessment can be formulated for the impacts of the planned activity on each component;

– These assessment criteria are supported by information for most of the area under consideration and are expressed by qualitative or numerical values;

– The components are approximately mutually comparable in terms of numbers of assessment criteria,

– The number of components is not too large.

By way of example, we will now consider the list of the components assessed for selection of the corridors for the route of the cold water conduit for a large thermoelectric plant near Irkutsk. In selecting the components for environmental impact assessment and defining the best choice for the route, the following factors were taken into consideration:

– The water conduit is not a facility of increased hazard, and its environmental impact, when in operation, is slight;

– A critical environmental impact should be expected from the construction of the water conduit, due to removal of land, vegetation and other resources for the corridor of the route, and to the conditions (primarily, engineering-geological) under which the construction will be carried out;

– The future route will not be in conflict with the architectural-planning policies in regard to urban development.

With the above factors considered, the following natural and social environmental components were chosen:

– Engineering-geological conditions,
– Vegetation,
– The established land use pattern, and
– The urban development plan.

The impact of the water conduit or the relevant level of conflict was assessed for these components. The prime objective of such assessment was to decide on the best choice of the route. In this context, the impact on the atmospheric air was not assessed, as it is about identical for all variants of the route. The impact on soils was also not assessed separately, since in the area under consideration, the amount of agricultural land is negligible, and the assessment for its removal was made in the land use analysis.

Impact assessment proceeded as follows: Available information on each component was used to generate spatial distribution maps for each characteristic. These were then assessed using certain criteria for categories of significance, sensitivity or conflict with regard to the expected impact of the construction of the route on the entire area. The assessment results served as a basis for compiling component-referenced maps of impact level. Input information was transformed to assessment maps using assessment scales that were described for each component separately.

Engineering-Geological Conditions

The engineering-geological conditions which would be altered by the construction of the route or, which would make the construction work significantly more difficult, are considered. Such conditions include:

– Landforms (primarily, dissection and gradient),
– Exogenous processes,
– Types and properties of earth material, and
– The groundwater table.

Table 7. Assessment Scales for Various Engineering-Geological Characteristics in Terms of Sensitivity Categories

Characteristic and its value	Sensitivity
Intensity of exogenous processes	
Moderate	high
Low	moderate
No exogenous processes	low
Land surface gradients, degrees	
>15	high
7-15	moderate
<7	low
Types of earth materials	
Peatlands	high
Sands of different grain sizes, porosity and moisture content, cailloutis	moderate
Loams, clays, sandstone, aleurites, argillites	
Groundwater table, m	
<2	high
2-5	moderate
>5	low

Impact assessment of the construction of the water conduit on the engineering-geological situation was carried out by determining the sensitivity of the above processes and characteristics to such impacts. Allowance was also made for the possible effect of engineering-geological conditions on the construction and operation of the facility. Thus, impact assessment in terms of category of sensitivity considered the bilateral linkage between engineering-geological conditions and implementation of the project. Sensitivity was determined in terms of three classes: high, moderate, and low. For all characteristics under consideration, scales were generated; as shown in Table 7.

The sensitivity values for the entire set of engineering-geological conditions were combined sequentially, as shown in Fig. 44.

Two conjugate matrices were generated first. One matrix was for gradients and exogenous processes, and the other for types of earth materials and groundwater tables. In the first matrix, low sensitivity was assigned to areas with slight gradients and low intensity, or no exogenous processes. Moderate sensitivity was assigned to areas with <15° gradients, provided the exogenous processes were are slight or lacking altogether. High sensitivity was assigned to all other combinations of intensity of exogenous processes and gradients.

In the second matrix, low sensitivity was assigned to all earth materials, except for peatlands, with low water content. Moderate sensitivity was assigned to the same earth materials with moderate water content. High sensitivity was assigned to all types of earth materials with high water content, and to all peatlands.

Finally, the results for the two matrices were combined as follow: Low sensitivity was assigned to gently sloping areas with low intensity of exogenous processes, and with earth materials favourable to construction. Moderate sensitivity was applied for areas

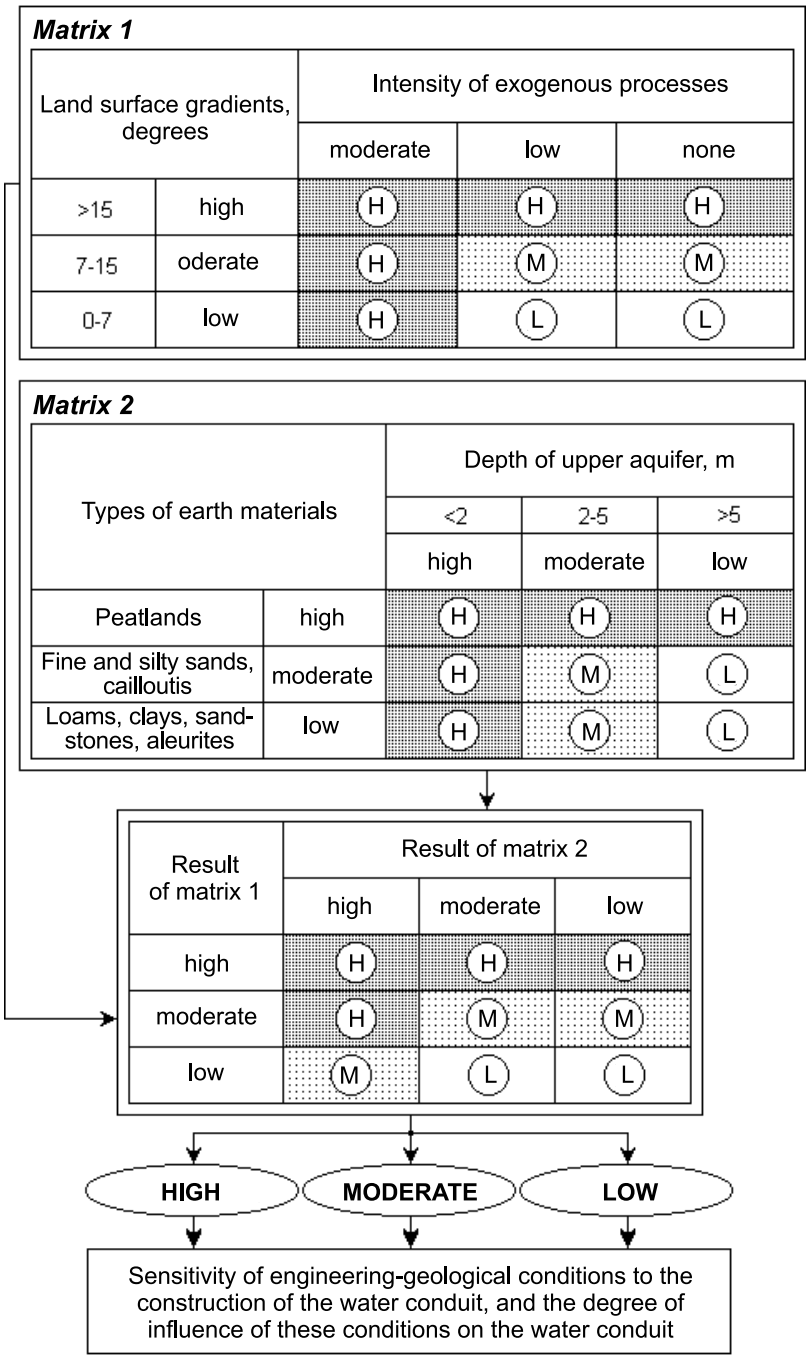


Fig. 44. Grouping of sensitivity values for engineering-geological conditions.

with moderate gradients, and with earth materials relatively favourable to construction, and to gently sloping hillsides with less favourable earth materials. All other areas were assigned to the category of high sensitivity.

The results of the combination of the profiles obtained from the first two matrices, constituted the framework for zoning the area based on the possible level of impact of the construction of the water conduit on engineering-geological conditions, and on the extent to which these conditions are favourable for the facility (Fig. 45).

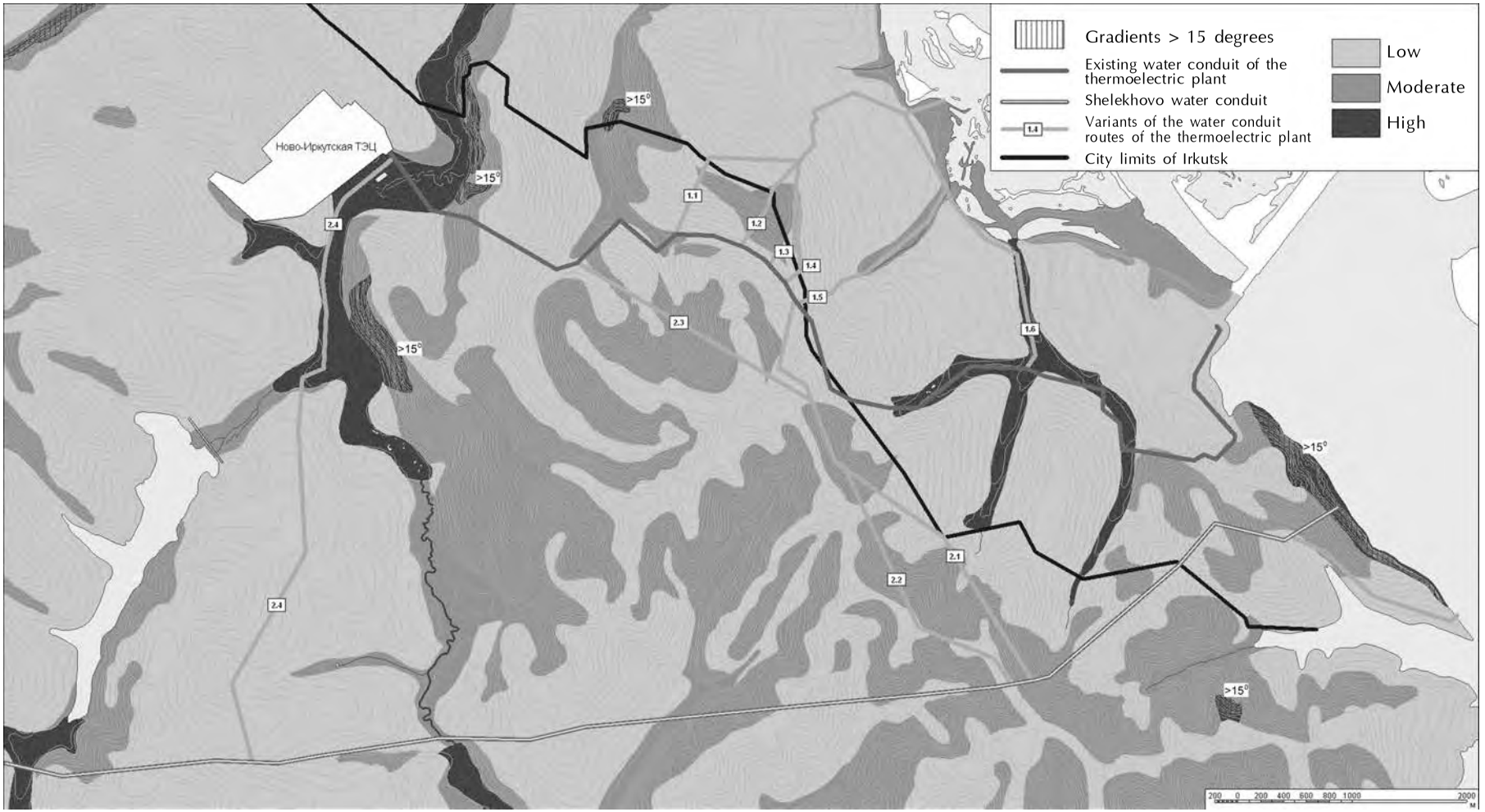


Fig. 45. Engineering-Geological Conditions. Sensitivity.

Vegetation

In the area under consideration, the following plant associations have been identified:

– Mixed pine and larch-pine associations with some aspen and birch, and with forbs,

– Mixed aspen-birch and pine-aspen-birch associations with forbs,

– Birch and larch-birch associations on lean swamp soils coupled with sedge and sedge-sphagnum swamps,

– Urban parks, forest parks, and green space with park functions, no infrastructure,

– Public gardens in housing estates,

– Nurseries,

– Unproductive associations (farmland, non-reforested clear-cut or burnt areas, waste-land of technogenic origin), meadow wastelands with isolated trees and shrubs.

The water conduit project involves the following impacts on vegetation cover:

– Devastation of the area with total, irreparable destruction of vegetation cover along the water conduit route, technological roads, and access roads;

– Changes in vegetation composition along the route, with increased abundance of weed species and a decrease of forest species;

– Damage to or destruction of vegetation cover, in the technological zone on the area adjacent to the project during construction, with a prospect for natural recovery, or for forest rehabilitation and melioration measures;

– Temporary pollution and contamination of soils with fuels and lubricants, and air pollution from construction equipment; and

– Temporary local soil underflood if there is a break of the water conduit.

Thus, the greatest impacts on vegetation cover are destruction during the construction phase. Therefore, vegetation sensitivity need not be considered here, so that it is advisable to analyse the area in terms of the category of significance of the plant communities identified. The most acceptable water conduit route option should be that with vegetation that is least significant for the human environment.

Determining the significance of vegetation took into consideration that the area of the projected construction site is a forests of the first group, where felling as the main utilisation is prohibited. The main purpose of these forests is water protection, , sanitary-hygienic and rehabilitation, provided by the degree of protection of each forest area. The assessment of the significance of vegetation used three generalised indices:

– Type of vegetation,
– Degree of disturbance of vegetation cover, and
– Location in to specially protected areas.

The significance was assessed in terms of three classes: high, moderate, and low. The valuation scale for these indices is given in Table 8.

If a plot of a definite type of vegetation coincided with a specially protected area, its significance was increased by one level. The results derived from assessing the significance of vegetation were represented as the zoning framework, shown in Fig. 46.

The most significant according to this framework are the forest areas beyond the city limits, with a small reserve of timber (height, diameter, and age): weakly or moderately disturbed, medium-aged and mature mixed pine and larch-pine forests, with some pine and birch, and forbs. Within the city limits, there are old forest parks, former cemeteries, groves, and extensive areas of green plantations aged thirty to fifty, with urban park functions and no infrastructure. Areas of low significance include woodless spaces with destroyed and non-reforested vegetation cover. The other associations, though differing in their functions, specific character of uses and stability to impacts, differ little in their significance, and are categorised in the moderate level.

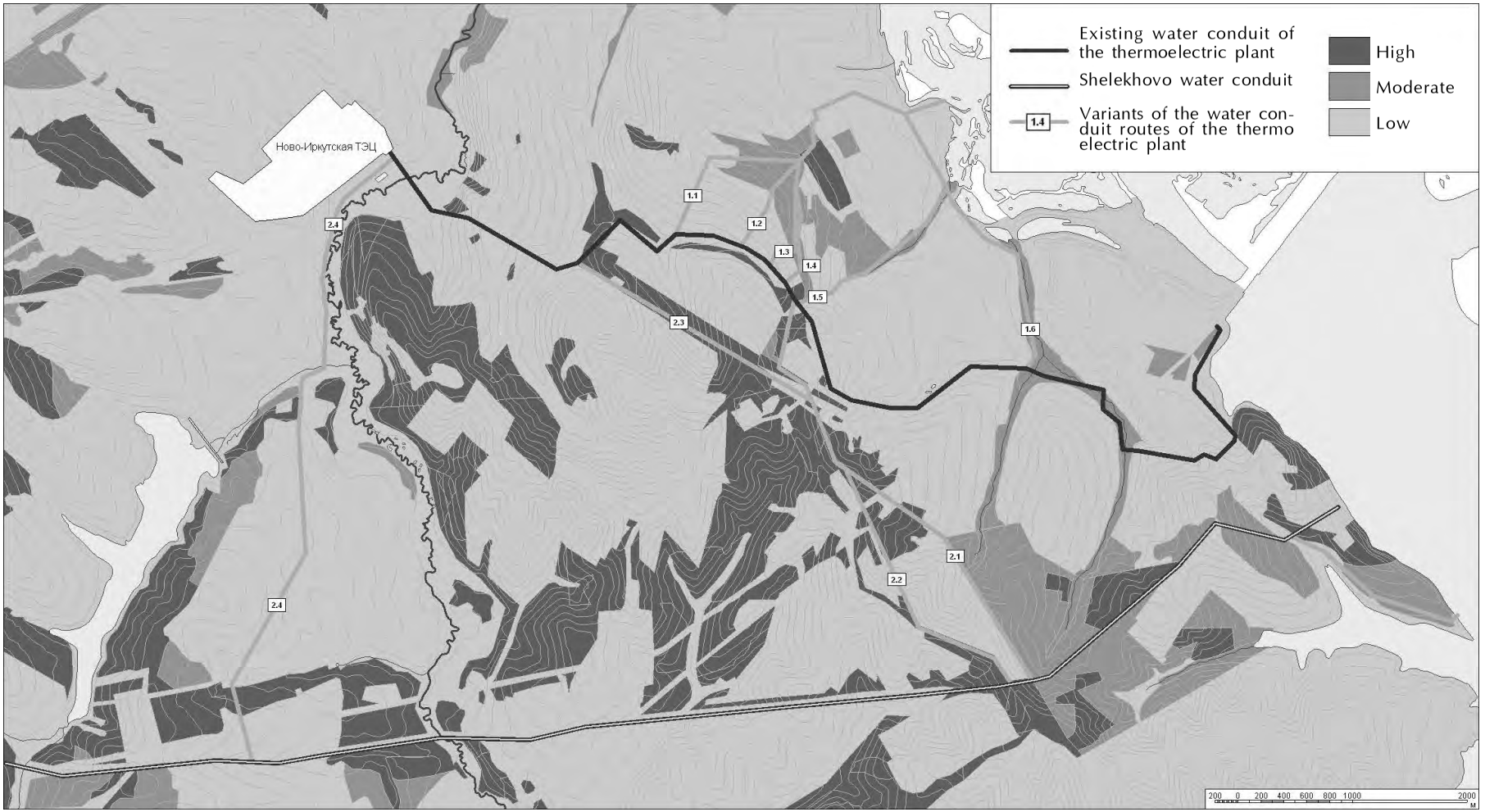


Fig. 46. Vegetation. Significance.

Table 8. Scale for Assessing Vegetation Significance

Type of vegetation, and characteristic of its state	Significance
Mixed pine and larch-pine vegetation, with aspen and birch trees, and forbs. Weakly or moderately disturbed, closed canopy, medium-aged, and mature	high
Same, but strongly disturbed, or of anthropogenic origin (forest crops), not closed, young	moderate
Mixed aspen-birch and pine-aspen-birch with forbs. Weakly and moderately disturbed, closed, medium-aged and mature	high
Same, but strongly disturbed or of anthropogenic origin (forest crops), not closed, young	moderate
Birch and larch-birch on lean swamp soils coupled with sedge and sedge-sphagnum swamps. Low-quality sparse wood stands, shrubs, woodless areas, and curtains	moderate
Urban parks, forest parks, and green plantations performing functions of parks with no infrastructure. Of anthropogenic origin, and for permanent recreational use	moderate
Public gardens in housing estates. Of anthropogenic origin, mature closed green plantations, permanent recreational use	moderate
Nurseries. Of anthropogenic origin (fruit-and-berry bearing ornamental plantations), annually cultivated	moderate
Unproductive (agricultural lands, unreforested clear-cut and burnt areas, wastelands of a technogenic origin), also meadow wastelands with isolated trees and shrubs. Destroyed, with partial or total degradation of vegetation cover and soils	low

The Land Use System

The objective of the analysis of the land use system is to decide on the variant of the route with the least conflict for land users. Therefore the landholdings were categorised according to the pattern of land use, primarily in terms of the possible alienation of lands to permanent or temporary tenure. The following kinds of land use were identified:

For the area in general:

– Multi-storey housing estates,
– Homesteads (built-up),
– Households (granted for construction purposes),
– Garden-plot and *dacha* societies and cooperatives,
– Garage co-operatives,
– Production organisations,
– Scientific establishments, public health, and educational institutions.

Within the city limits:

– City-owned land: transportation and engineering infrastructure,
– City-owned land: other lands, including reserve areas.

Outside the city limits:

– *Goslesfond*lands (State Forest Reserves),
– Agricultural lands (farmland, hayfields, pastureland, peasant's farmsteads, etc.),
– Transportation and engineering infrastructure (roads, power lines, pipelines, communication lines, etc.),
– Other developed lands (the communities of Markovo, Novo-Irkutsky, Beryozovt, and Izumrudny), including reserve areas.

In terms of level of conflict as regards utilisation for the purposes of the water conduit route, these types of lands are classed as high, moderate, and low conflict potential. The highest level of conflict potential, where no intended project would be feasible, is assigned to the lands of multi-storey housing estates the and capital garage cooperatives. This also includes lands of production organisations, as the normative documents prohibit the laying of water conduits across the area of industrial enterprises.

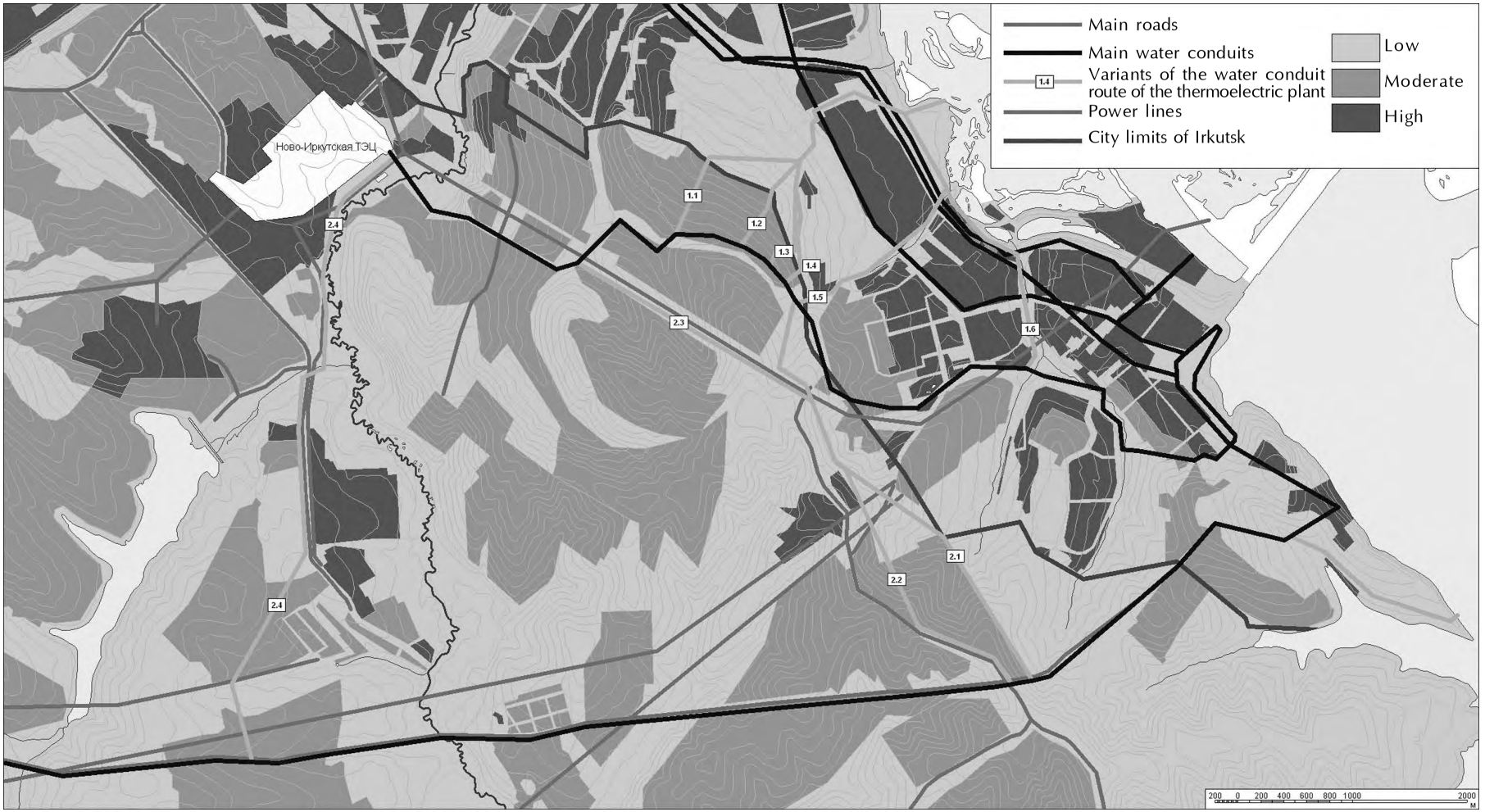


Fig. 47. The level of conflict in land use for the new route.

Lands under individual housing estates (built-up and granted for housing development), lands of garden-plot and *dacha* societies, and agricultural lands were for the most part assigned to the moderate level of conflict potential, under which any alienation would be accomplished by bilateral agreement stipulating the form and amount of compensation. The other lands are in state ownership at various levels (federal, regional, municipal), or granted for long-term use. For such lands, a low level of conflict potential is projected in case of alienation, since given the high social significance of the project, Article 49 of the Land Code allows, if necessary and in the absence of other options, land to be alienated from existing land users for the purposes of water conduit routes.

The category of low level of conflict included also potential the lands of the transport and engineering infrastructure (roads, power lines, pipelines, etc.), as in most cases the laying of the water conduit is possible within the existing corridors of these line structures. The general assessment scale for the levels of conflict is presented in Table 9.

Table 9. Assessment Scale for the Level of Conflict Potential for the Laying of the Water Conduit

Level of conflict	Type of lands
High	multi-storey housing estate, garage cooperatives, lands of production organisations
Moderate	lands of homestead development (built over and granted for construction purposes), horticultural and *dacha* societies and cooperatives, lands of agricultural purposes (arable lands, hayfields, pasture lands, peasant's farmsteads, etc.)
Low	lands of scientific, public health and educational establishments, urban lands (transport and engineering infrastructure, other lands, including reserve areas, and lands in store), lands of Goslesfond (State Forest Reserves), other settlement areas, including reserve areas, lands of the transport and engineering infrastructure beyond the city limits (roads, power lines, pipelines)

The framework of zoning the area according to the level of conflict in land use for the laying of the water conduit is shown in Fig. 47.

The Urban Development Plan

The water conduit is a capital structure of a long service life. Therefore, in addition to complying with the existing land use pattern, it should conform to long-term spatial development plans. A key document in this regard that defines the potential of long-term development and location of civil and industrial projects according to the Urban Development Code, is the Spatial Plan for urban development. It includes, among other things, the framework of architectural-functional zoning that makes it possible to appraise the conformity of the various versions of the water conduit to the long-term plans of urban development.

The conformity level for the laying of the water conduit with the Spatial Plan for development of the city of Irkutsk was assessed in each architectural-functional zone, similarly to the assessment of the conflict level in land use, as in the context of the site selection for the route, these zones and types of land use are conceptually similar in many respects. The assessment scale is provided in Table 10.

This scale was used to compile the spatial zoning map of the conformity level for laying the water conduit under the urban development architectural-planning concept (Fig. 48).

Integral Impact Assessment

The relevant assessment maps were combined to obtain an integral estimate of the conflict level for the siting of the route from all components considered above (see Figs.

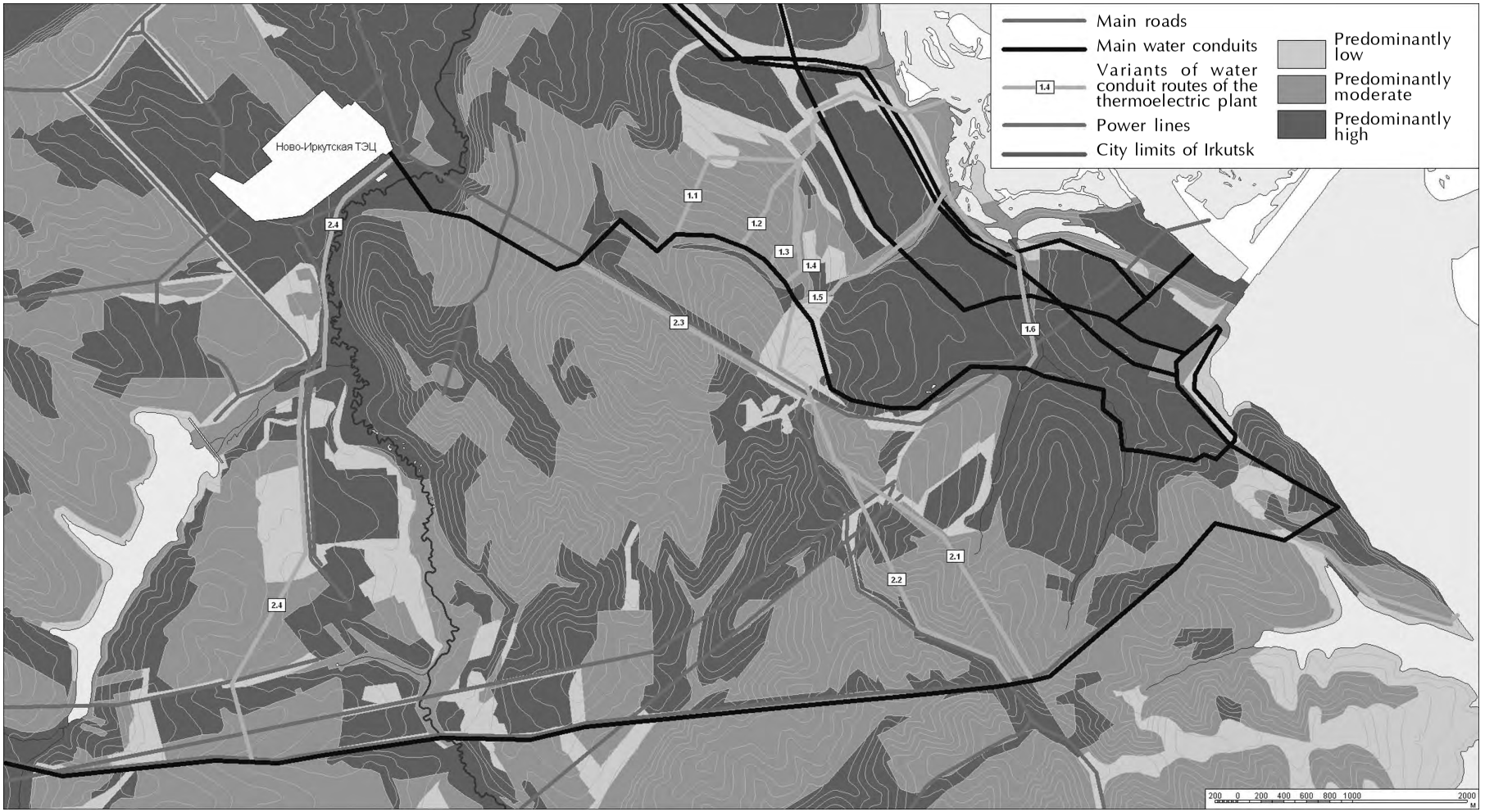


Fig. 48. Conformity with the Spatial Plan for Development of the City of Irkutsk.

Table 10. The assessment scale for the conformity level of the laying of the water conduit to the concept of the Spatial Plan for development of the city of Irkutsk

Conformity level	Architectural-functional zone
Low	Protected multi-storey housing estate, multi-storey housing estate on the reconstructed, public areas, industrial areas with some socio-business functions
Moderate	homestead development that is preserved, homestead development on free areas
High	scientific-production areas, parks, public gardens, and recreational areas

45-48). The combination procedure followed a very stringent framework, shown in Fig. 49. The conflict level at any point being analysed was assumed to be the most unfavourable of the four maps. Thus, for instance, a low conflict level was assumed only when that was indicated on all four maps.

Like the component-referenced maps, this map was generated for high, moderate, and low conflict levels. It was drafted using a large body of input information in a variety of numerical and qualitative forms. With this information integrated, it underwent some roughening, with some of it inevitably lost. That was also due to the relatively small scale of the input information, usually ranging from 1:10,000 to 1:25,000. Therefore, the value of the conflict level for a particular plot of land should be interpreted as the general value for the immediate area. On the other hand, a high conflict potential for a particular portion of the area does not imply unconditional prohibition of the intended practices, but it only indicates that complicated problems might be encountered here, which would require a great deal of effort to overcome, and might be impracticable or impossible in some cases. To determine the particular content of the problems, one should use assessment maps and maps of input information. The chief purpose of the above comprehensive regional representation is to show areas with the smallest number of problems where the water conduit could preferably be sited. The interpretation of the conflict classes identified for the area is shown in Table 11.

Table 11. Interpretation of Conflict Levels in Site Selection for the Water Conduit Route

Conflict Level	Nature of Conflict, Preferred Action
High	Complicated nature conservation and engineering or land use problems, possibly requiring a great deal of effort to resolve. Such sections should be largely avoided in siting.
Moderate	Nature conservation and engineering or land use problems, which could be resolved by developing special-purpose nature conservation, engineering or compensation measures. Siting is possible with such measures in place
Low	Existing problems can be resolved by the usual measures. No legal problems of land use are apparent. Siting in these areas is recommended.

The zoning map according to the integral index of conflict level is shown in Fig. 50.

It is evident from the map that the area has a very small number of conflict-free areas, and their surface area is small (about 10%), which is normal for a major city and its immediate surroundings. Obviously, siting the route in this zone is not realistic; just as obviously, part of it will have to pass through the moderate conflict zone.

The integral zoning map was used, with due regard for technical conditions, to decide between route variants, so that they run largely through moderate conflict level areas. The crossing length in a certain level zone was taken as the comparison measure. Where necessary, the route was refined using component-based assessment maps.

"All projects should be very sound, lest the treasury be devastated and our Fatherland damaged. Whomsoever shall be negligent with projects, I will dismiss from his post and let him feel the knout – for the edification of the successors"

Peter I

CONCLUDING REMARKS

In closing this book, we should point out that the authors are well aware of the complexities and difficulties of implementing landscape planning tools in the Russian Federation, which include not only creation of a legal foundation for the planning policy, but also the lack of such specialists as ecologists, geographers, economists, cartographers and others with the skills needed to generate a uniform planning document on a participatory basis, united by a common commitment. For the time being, it is obvious that society itself lacks the necessary preparation and motivation. It has too long been true in this country that planning has been understood as a process of imposing the state's unbending will, frequently in such a way as to prejudice the interests of certain producers and of the population.

On the other hand, the potential of landscape planning is varied and obvious. Too often, society has been forced to make a correct decision with too few facts. However, decision-making should rely not on emotions and trivial economic concerns, but on well-grounded assessments of native and natural values and social consequences. Historically, land-related conflicts in Russia have provided some major shocks. Only the creation of the basis for conflict-free land relations can, in our view, provide the basic component for sustainable development.

Russia has an absolutely unique natural world asset, its native and natural landscapes. In the immense expanses of Siberia and the Far East, there are still places "not touched by a human foot". But it is not enough to pinpoint on a map or picture such native reserves; instead, one has to assess them, delineate their boundaries, and safeguard them against the all-penetrating eye of human avidity and economic rationalism. For this purpose, landscape planning can and should become the major tool.

The chief argument in favour of the suggested methodology is the quality of project documents, and their targeted focus. Only practice can support or refute the ideas and projects, and in this context the authors subscribe to the exhortation of a great ruler, Peter I.

REFERENCES

IN RUSSIAN [Titles given in English translation; books/articles are not translated, except where indicated.]

Antipov A.N. and Fedorov V.N. *Landscape-Hydrological Organisation of the Territory.* Novosibirsk: Izd-vo SO RAN, 2000.

Antipov A.N., Drozdov A.V, Kravchenko V.V. *et al*. Eds. *Landscape Planning: Principles, Methods, and European and Russian Experience* Bonn – Moscow – Irkutsk. Irkutsk: Institute of Geography SB RAS Publisher., 2002, 141 pp.

Antipov A.N., Kravchenko V.V., Semenov Yu.M.*et al*. *Landscape Planning*: *The Tools and Experiences in implementation*. Irkutsk: Institute of Geography SB RAS Publisher, 2005, 165 pp.

Area Planning. Designer's Manual, Moscow: Stroiizdat, 1986.

Armand D.L. *The Physical-Geographical Basics for Designing a Network of Shelter Belts.* Moscow: Izd-vo AN SSSR, 1961.

Brade I., Pertsik E.N. and Pitersky D.S. *Area Planning, and Elaborating Settlement Patterns: Experience and Prospects.* Moscow: Mezhdunarodnye otnosheniya, 2000.

Ecological optimisation of Agrolandscape. Moscow: Nauka, 1987.

Ecologically Oriented Land Use Planning in the Baikal Region. The Golustnaya River Basin. Irkutsk-Hannover, 1997. Text and a sequence of 11 maps at a scale of 1:200,000 in Russian and German.

Ecologically Oriented Land Use Planning in the Baikal Region. The Olkhon District. Irkutsk–Hanover, 1998. Text in Russian, German and English, and also four sections of maps, and one full map of the Olkhon District at a scale of 1:200,000.

*Ecologically Oriented Land Use Planning in the Baikal Region. The Olkhon District: Framework Plan of Ecologically Oriented Land Use*at a scale of 1:200,000. Yu.M.Semenov, A.N.Antipov, V.V.Bufal *et al.* Irkutsk – Hanover: Institute of Geography SB RAS Publishers, 1998.

Ecological Zoning of the Baikal Natural Territory: Draft Version. Irkutsk: Institute of Geography SB RAS Publishers, 2002.

Federal Law "On Specially Protected Natural Territories" No. 33-FZ of 14 March 1995. SZ RF, 1995, No. 12, p. 1024.

Federal Law "On the Protection of Lake Baikal" No. 94-FZ of 1 May 1999.

Federal Law "On Natural Environment Conservation" No. 7-FZ of 10 January 2002.

Federal Law "On Ecological Revision" of 23 November 1995. SZ RF, 1995, No. 48, p. 4556.

Forest Code of the Russian Federation No. 22-FZ of 29 January 1997. SZ RF, 1997, No. 5, p. 610.

Geo-ecological Principles of Designing Natural-Engineering Geosystems. Moscow: Institute of Geography USSR AS Publishers, 1987.

Gritsenko E.V. Prob*lems of Developing Regional Legislation on Spatial Planning in the Russian Federation. Land Use Planning: Legal Issues* (Based on Experience of the Russian Federation and the Federal Republic of Germany). Irkutsk: Institute of Geography SB RAS Publishers, 1999.

Handbook on Landscape Planning. Vol. II. Methodological Recommendations on Landscape Planning. Moscow: State Centre for Ecological Programs, 2001, 73 pp.

*Land Code of the Russian Federation*No. 136-FZ of 25 October 2001.

*Manual on Landscape Planning.*Vol. I. *Principles of Landscape Planning, and the Concept of Its Development in Russia.* A.N.Antipov, I.N.Volkova, E.V.Gritsenko et al. Moscow: State Centre for Ecological Programmes, 2000.

Manual on Landscape Planning. Vol. II. *Procedural Recommendations for Landscape Planning*. A.N.Antipov, V.V.Kravchenko, Yu.M.Semenov et al. Moscow: State Centre for Ecological Programmes, 2001.

Regulations on Water Protection Zones of Water Bodies and Their Inshore Shelter Belts. Ordinance of the Government No. 1404 of 23 November 1996.

Technogenic Flows of Material in Landscapes, and Status of Ecosystems. Moscow: Nauka, 1981.

Spatial Organisation of the Zabaikalsky National Park. A.D. Abalakov, E.D. Ovdin, L.S. Novikova *et al*. Irkutsk: Institute of Geography SB RAS Publishers, 2002.

Urban Development Code No. 190-FZ of 29 December 2004.

Winter G. *An Outline of Land Use Planning in the F.R. of Germany. Land Use Planning: Legal Issues based on experience of the Russian Federation and the Federal Republic of Germany*). Irkutsk: Institute of Geography SB RAS Publishers, 1999.

Water Code of the Russian Federation No. 167-FZ of 16 November 1995. SZ RF, 1995, No. 47, p. 4471.

IN ENGLISH AND GERMAN

BDLA (Bund Deutscher Landschaftsarchitekten 2004): *Baugesetzbuch 2004*. *Die neue Umweltpruefung*. Eigenvertrieb BDLA, Berlin.

BfN – Bundesamt fuer Naturschutz (2002): *Perspektiven und Strategien fuer die Landschaftsplanung.* Results of an Expert workshop on LN, by the BfN, 5-7 June 2002, Vilm Island. http://www.bfn.de/03/vivi2002.pdf

Bruns, D. (2003): Was kann Landschaftsplanung leisten? Alte und neue Funktionen der Landschaftsplanung. *Naturschutz und Landschaftsplanung* 35 (4), pp. 114-118.

Bundscherer S., Kenneweg H., Rosenstein C., Schleuning T., Weckwerth H. *Einführung in die Theorie und Methodik der Landschaftsplanung*. Berlin, 1991.

Dietz K., von Rauch A. *Landschaftsplanung? Das kommt mir spanisch vor... Die spanische Naturressourcenplanung am Beispiel Andalusien*. 4th Projekt at the Institute for Landscape Care und Conservation at the University of Hannover, 2000. Ms.

Ermer, K., Hoff, R. & Mohrmann, R. (1996): *Landschaftsplanung in der Stadt*. Ulmer Verlag, Stuttgart.

Faludi A., van der Falk A. Rule and Order – *The Dutch Planning Doctrine in the 20th Century*, Dordrecht-London, 1994.

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety Germany (1998): *Landscape Planning – Contents and Procedure.* Self-pub., BMU, Berlin.

Fisahn, A. (2004): *Effektive Beteiligung solange noch alle Optionen offen sind – Oeffentlichkeitsbeteiligung nach der Aarhus-Konvention*. ZUR 3/2004, pp. 136-140.

Friese K.-I., Hachmann R. & Wolter, F.-E. (2003): *Content Management Systeme in der Landschaftsplanung*. Corp 2003, pp. 419-426.

Gassner, E. & Winkelbrandt, A. (1997): *UVP – Umweltvertraeglichkeitspruefung in der Praxis. Methodischer Leitfaden.* 2. Aufl. Jehle-Rehm Verlag, Muenchen.

GfU (Gesellschaft fuer Umweltplanung, Forschung und Beratung) (2002a): *Landschaftsrahmenplan – Landkreis Havelland*. Band I: Entwicklungskonzept. Fassung Januar 2002. Berlin.

GfU (Gesellschaft fuer Umweltplanung, Forschung und Beratung) (2002b): *Landschaftsrahmenplan – Landkreis Havelland*. Band II: Bestandserfassung und Bewertung. Fassung Januar 2002. Berlin.

Gruehn, D. & Kenneweg, H. (1998): *Beruecksichtigung der Belange von Naturschutz* und *Landschaftspflege in der Flaechennutzungsplanung.* BfN, Bonn, Landwirtschaftsverlag, Muenster (*Angewandte Landschaftsoekologie*, no. 17).

Gruehn, D. & Kenneweg, H. (2002): *Wirksamkeit der oertlichen Landschaftsplanung im Kontext zur Agrarfachplanung.* (....). Federal Conservation Agency (BfN) Eigenvertrieb, Bonn-Bad Godesberg.

Grunberg, K.-U. (2002): Landschaftsrahmenplan. In Lange, H. & Riedel, W. (eds.) (2002): *Landschaftsplanung*. 2nd ed. Spektrum Akademischer Verlag. Heidelberg, Berlin.

Haaren, C. v. *et al. Landschaftsplanung und strategische Umweltpruefung* (SUP). UVP-Report 1, Hamm, 2000.

Haaren, C. v. (2004a): Perspektiven der Landschaftsplanung. In: Haaren, C. v. (eds.): *Landschaftsplanung*. Ulmer Verlag, Stuttgart, pp. 465-472.

Haaren, C. v. (2004b): *Landschaftsplanung*. Ulmer Verlag, Stuttgart.

Hachmann, R (2004): *Interaktive Landschaftsplanung in Koenigslutter am Elm*. Corp 2004, pp. 483-488.

Herbert, M. & Wilke, T. (2003): Stand und Perspektiven der Landschaftsplanung in Deutschland; V. Landschaftsplanung vor neuen Herausforderungen. *NuL* 78 (2), pp. 64-71.

Julius Gy. Fabos, Computerisation of Landscape Planning, *Landscape and Urban Planning*, vol. 15, Nos. 3-4, 1988.

KI – Kasseler Institut fuer laendliche Entwicklung e.V. (2004): *Beitraege der flaechendeckenden Landschaftsplanung zur Reduzierung der Flaecheninanspruchnahme*. Papers of an experts' meeting on a research project at the Hofgeismar Protestant Academy, unpublished.

Konzept zur Aufstellung des Landschaftsprogramms fuer das Land Brandenburg. – Hannover: Planungsgruppe "Oekologie + Umwelt", 1992.

Kraemer L. *Umweltpolitische Aktionsprogramme mit Leitlinien und Reglungsansaetze. Handbuch zum europaeischen und deutschen Umweltrecht*. B.1 Allgemeines Umweltrecht, Carl Heymanns Verlag, Koeln, 1998.

Landschaftsplanung. Inhalte und Verfahrensweisen. Bonn: Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, 1997.

Lange, H. (2002): Landschaftsprogramm. In: Lange, H. & Riedel, W. (eds.) (2002): *Landschaftsplanung*. 2nd ed. Spektrum Akademischer Verlag. Heidelberg, Berlin.

MUNF (Schleswig-Holstein State Ministry of the Environment, Nature and Forestry) (eds.) (1999): *Landschaftsprogramm Schleswig-Holstein*. Kiel.

Oppermann, B. & Tiedtke, S. (2004): Zweiter Zwischenbericht, Wissenschaftliche Begleitforschung zum E+E-Vorhaben „Interaktiver Landschaftsplan Koenigslutter am Elm", Zeitraum: Juni 2003 bis Juni 2004. IFPS, Hannover (unpublished).

Ott, S., Haaren, C. v., Myrzik, A., Scholles, F., Wilke, T., Winkelbrandt, A. & Wulfert, K. (2004): Erste Forschungsergebnisse zum Verhaeltnis von strategischer Umweltpruefung (SUP) und Landschaftsplanung. Intermediate results from the R&D project SUP and Landscape Planning at the Institute for Landscape Care and Conservation (ILN) and Landscape Planning and Spatial Research (ILR) at the University of Hannover, for the BfN. *NuL* 78 (7), pp. 323-325.

Planungsgruppe Oekologie+Umwelt (1998): *Landschaftsplan Genthin. Landschaftsplanung zur Flaechennutzungsplanung als Instrument umweltvertraeglicher Kommunalentwicklung.* Schriftenreihe Beispiele aus der Planungspraxis. Ed.: Bund Deutscher Landschaftsarchitekten BDLA, Berlin.

Planzeichen fuer die oertliche Landschaftsplanung. BfN. Muenster-Hiltrup, 2000.

Rydin Y. The British Planning System: an Introduction. London, 1993.

Schroeder M. *Umweltschutz als Gemeinschaftsziel und Grundsaetze des Umweltschutzes.* Manual on European and German Environmental Law. B.1 General Environmental Law. Carl Neymanns Verlag, Cologne, 1998.

Tiedtke, S., Warren-Kretzschmar, B. & Hachmann, R. (2003): *Interaktive Landschaftsplanung, vorläufige Ergebnisse aus einem Forschungsvorhaben*. Lecture at the event "Stendal Landscape Plan, Pilot GIS application and implementation", 29 Oktober 2003, in Stendal.

Wende, W. (2000): Sicherung der Qualitaet von Umweltvertraeglichkeitsstudien durch die Landschaftsrahmenplanung. In: Gruehn, D.; Herberg, A.; Roesrath, C. eds.:., *Naturschutz und Landschaftsplanung – Moderne Technologien, Methoden und Verfahrensweisen*. Mensch & Buch Verlag, Berlin. pp. 289-298.

Young A. *Rural Land Evaluation. Evaluating Hanan Environment*. London, 1973.

Zenker U. *Landschaftsplanung in Frankreich*. Master's thesis at the Institute for Landscape Care and Conservation at the University of Hannover, 1999. Manuscript.

BOOKS ON LANDSCAPE PLANNING PUBLISHED AT THE INSTITUTE OF GEOGRAPHY SB RAS

Chepurnykh N.V., Merzlov A.V. & Antipov A.N. *Sustainable Development of the Rural Areas in Russia*. Concept and Recommendations. Irkutsk: Institute of Geography SB RAS Publishers, 2000 (in Russian, German and English).

*Ecologically Oriented Land Use on the Kovykta Gas-Condensate Field.*A.N. Antipov, S.A. Makarov, Yu.M. Semenov *et al*. Irkutsk: Institute of Geography SB RAS Publishers, 2004.

Ecologically Oriented Land Use Planning in the Baikal Region. Spatial Development of the Town of Baikalsk and Its Suburban Zone. E.G. Suvorov, A.N. Antipov, Yu.M. Semenov *et al.* Irkutsk: Institute of Geography SB RAS Publishers, 2003.

Ecologically Oriented Land Use Planning in the Baikal Region. Baikal Natural Territory. A.N. Antipov, V.M. Plyusnin, O.I. Bazhenova *et al.* Irkutsk: Institute of Geography SB RAS Publishers, 2002.

Ecologically Oriented Land Use Planning in the Baikal Region. Slyudyanka District. E.G. Suvorov, A.N. Antipov, Yu.M. Semenov *et al.* Irkutsk: Institute of Geography SB RAS Publishers, 2002.

Ecologically Oriented Land Use Planning in the Baikal Region. The Area of the River Selenga Delta. A.K. Cherkashin, L.M. Korytny, T.I. Konovalova *et al.* Irkutsk: Institute of Geography SB RAS Publishers, 2002.

*Ecologically Oriented Land Use Planning in the Baikal Region.*Olkhon District. Framework Plan of Ecologically Oriented Land Use at a Scale of 1:200,000. Yu.M. Semenov, A.N. Antipov, V.V. Bufal et al. Irkutsk – Hanover: Institute of Geography SB RAS Publishers, 1998.

Ecologically Oriented Land Use Planning in the Baikal Region. Olkhon District. Yu.M. Semenov, A.N. Antipov, V.V. Bufal et al. Irkutsk: Institute of Geography SB RAS Publishers, 2004.

Landscape Ecology and Land Use Planning: Abstract of Paper to an All-Russia Conf. (Irkutsk, September 11-12, 2000). Managing Editors V.A. Snytko and Yu.M. Semenov. Novosibirsk: SB RAS Publishers, 2000.

*Landscape Planning: Main Principles, Methods, European and Russian Experience.*A.N. Antipov, A.V. Drozdov, V.V. Kravchenko et al. Irkutsk: Institute of Geography SB RAS Publishers, 2002.

Land Use Planning: Legal Aspects(Based on Experiences of the Russian Federation and the Federal Republic of Germany). Managing Editor E.V. Gritsenko. Irkutsk: Institute of Geography SB RAS Publishers, 1999.

The Law of the Russian Federation “On Lake Baikal Protection” as a factor of sustainable development of the Baikal region: *Proc. Intern. Scient. Conf*. (Irkutsk, September 16-19, 2003). Managing editor A.N. Antipov. Irkutsk: Institute of Geography SB RAS Publishers, 2003.

Planning of Sustainable Development of Rural Areas(Oriented to Local Self-Government). The Pereslavl Municipal district of the Yaroslavl Region of the RF. A.V. Merzlov, A.N. Antipov, A. Westfall *et al*. Irkutsk: Institute of Geography SB RAS Publishers, 1999.

Spatial Organisation of Zabaikalsky National Park. A.D. Abalakov, E.D. Ovdin, L.S. Novikova et al. Irkutsk: Institute of Geography SB RAS Publishers, 2002.

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Scientific Edition

LANDSCAPE PLANNING: TOOLS, AND EXPERIENCES IN IMPLEMENTATION

Alexander Nikolayevich Antipov, Valery Vladimirovich Kravchenko, Yuri Mikhailovich Semenov, Alexander Vladimirovich Drozdov, Olga Vldimirovna Gagarinova, Vladimir Nikolayevich Fedorov, Natalia Vladimirovna Rogovskaya, Victor Maximovich Plyusnin, Victor Pavlovich Dedkov, Gennady Victorovich Grishanov, Maxim Gennadievich Napreyenko, Yevgeny Grigorievich Suvorov, Arnd Wilkelbranmdt, Wolker Milken, Christina von Haaren, Jens Schiller, Wolfgang Wende, Arne Neumann, Holger Olenburg, and Adrian Hoppenstaedt

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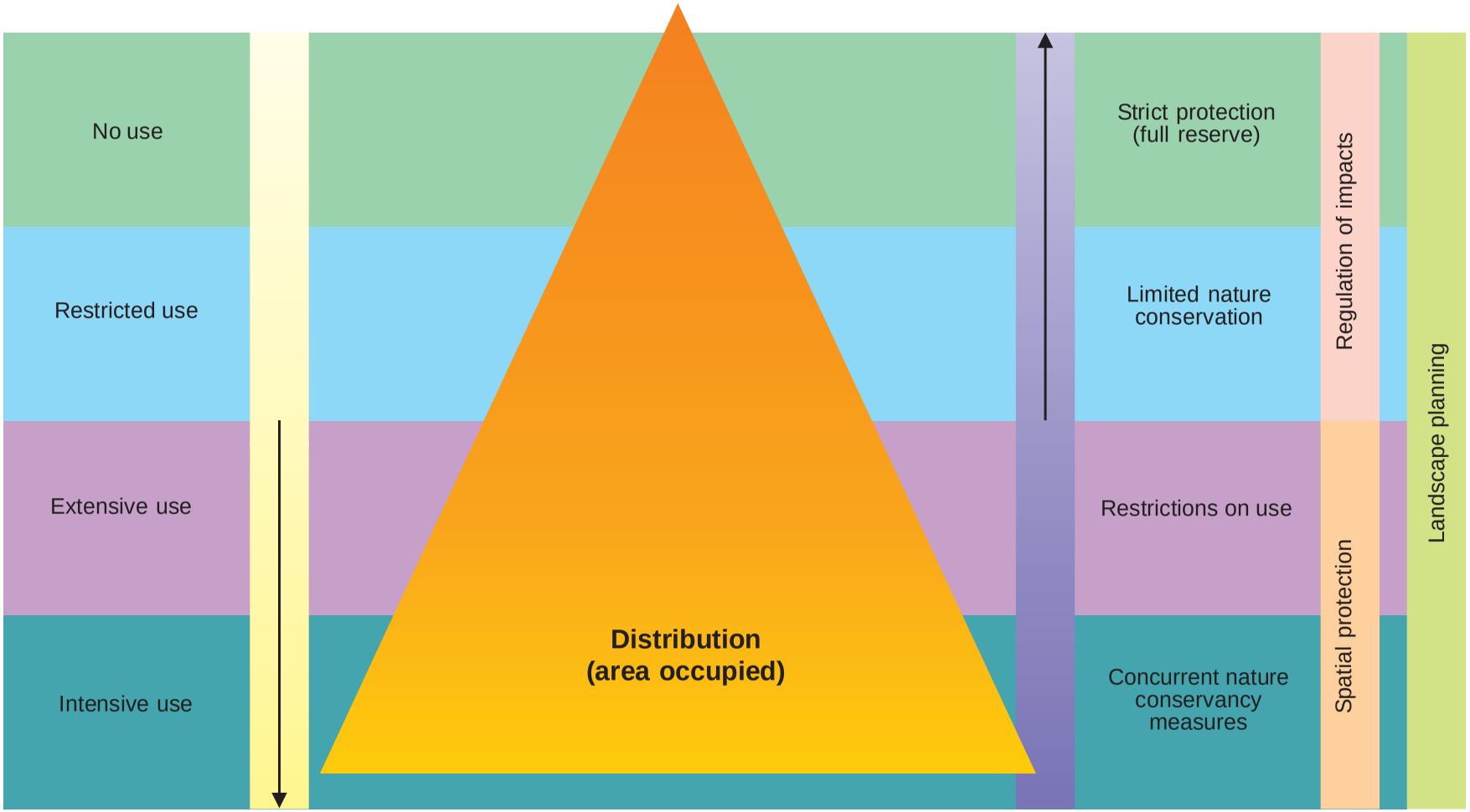


Fig. 3. Coverage of areas by spatial protection, regulation of impacts and landscape planning.

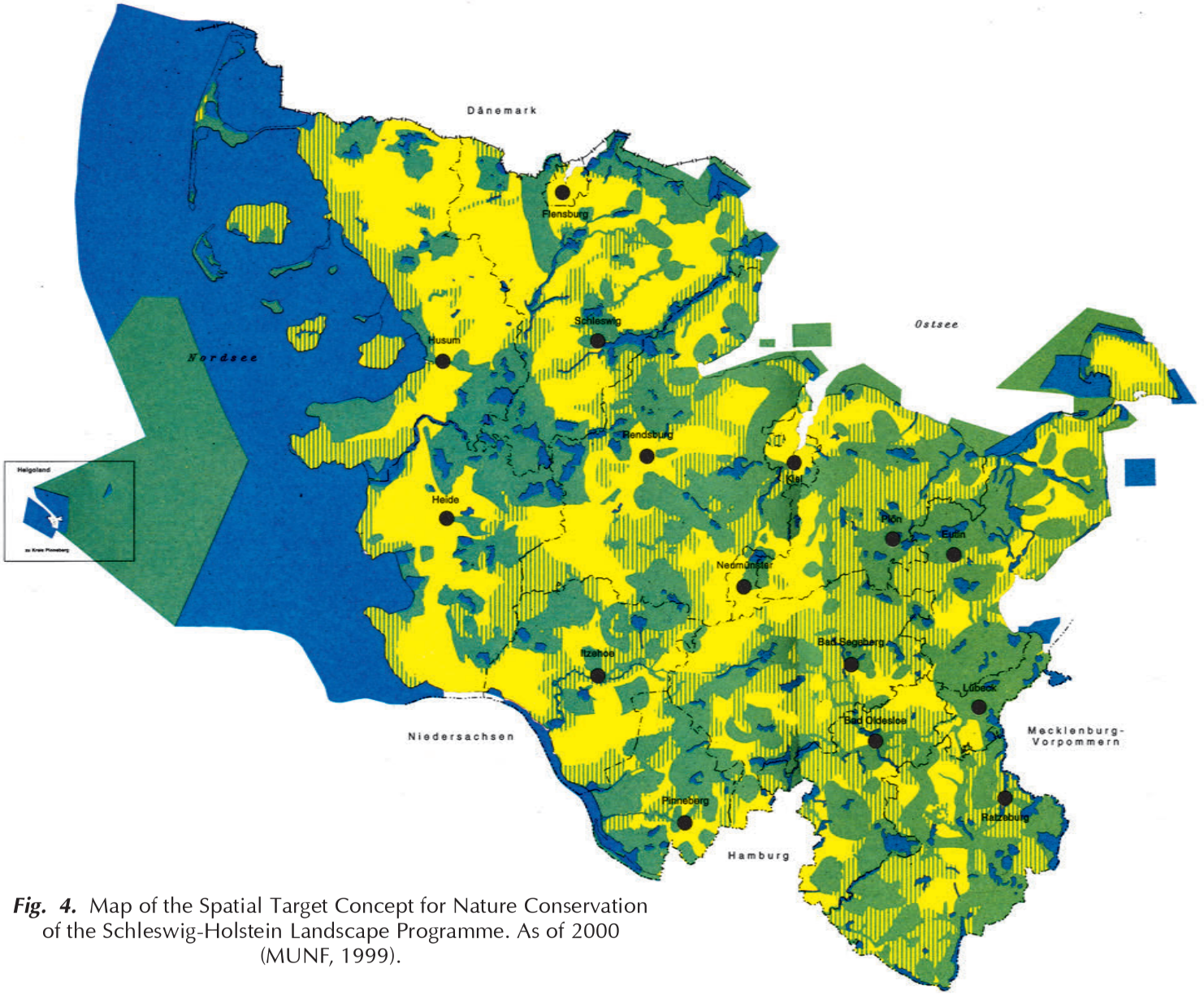


Fig. 4. Map of the Spatial Target Concept for Nature Conservation of the Schleswig-Holstein Landscape Programme. As of 2000 (MUNF, 1999).

Territories Intended Primarily for Near-Natural Development, with Maximum Conservation of the Natural Landscape

for a break-down of areas, see the map "Species and Biotopes, Natura-2000"

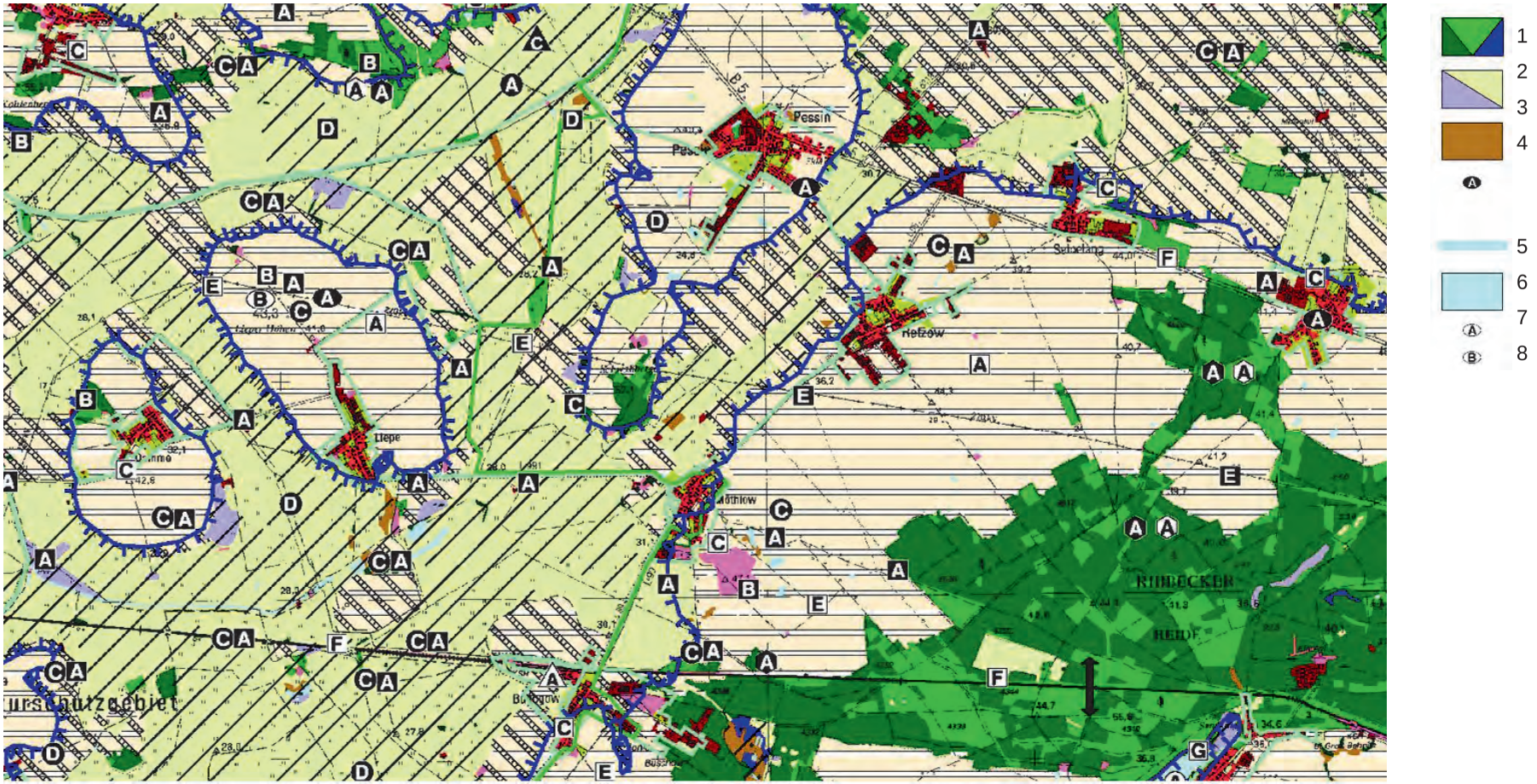
Territories Intended for Primarily Environmentally Appropriate Development

for a break-down of these areas, see the maps "Soils and geology / water bodies", "Landscape and recreation", "Species and biotopes", and "Species and biotopes, Natura-2000"

territories that belong in this category exclusively because of the special significance for conservation of landscape, its uniqueness and beauty, and also as recreation areas

Other Territories

The goal implies preserving the functions of the entire natural environment and ensuring the utilisation of natural assets.



Groundwater and Surface Water

What should be preserved?

Water resources should be preserved for aquatic and near-aquatic ecosystems in the Havelland.

1. The woodland areas should be preserved for conservation of flow regulation and for the protection of groundwater against pollution, contamination, and depletion.

2. Meadows should be preserved for conservation of relict runoff, and for the protection of the groundwater against pollution, contamination, and depletion.

3. Existing bogs should be preserved because of their water accumulation capacity, which is important for flow regulation.

4. Water resources which are suited as drinking water supply sources should be preserved.

What should be improved?

– Water resources should be improved for aquatic and near-aquatic ecosystems in the Havelland.

– Pollution of groundwater and surface water should be minimized through de-intensified and adapted land use.

– The natural water resources should be used in a thrifty manner.

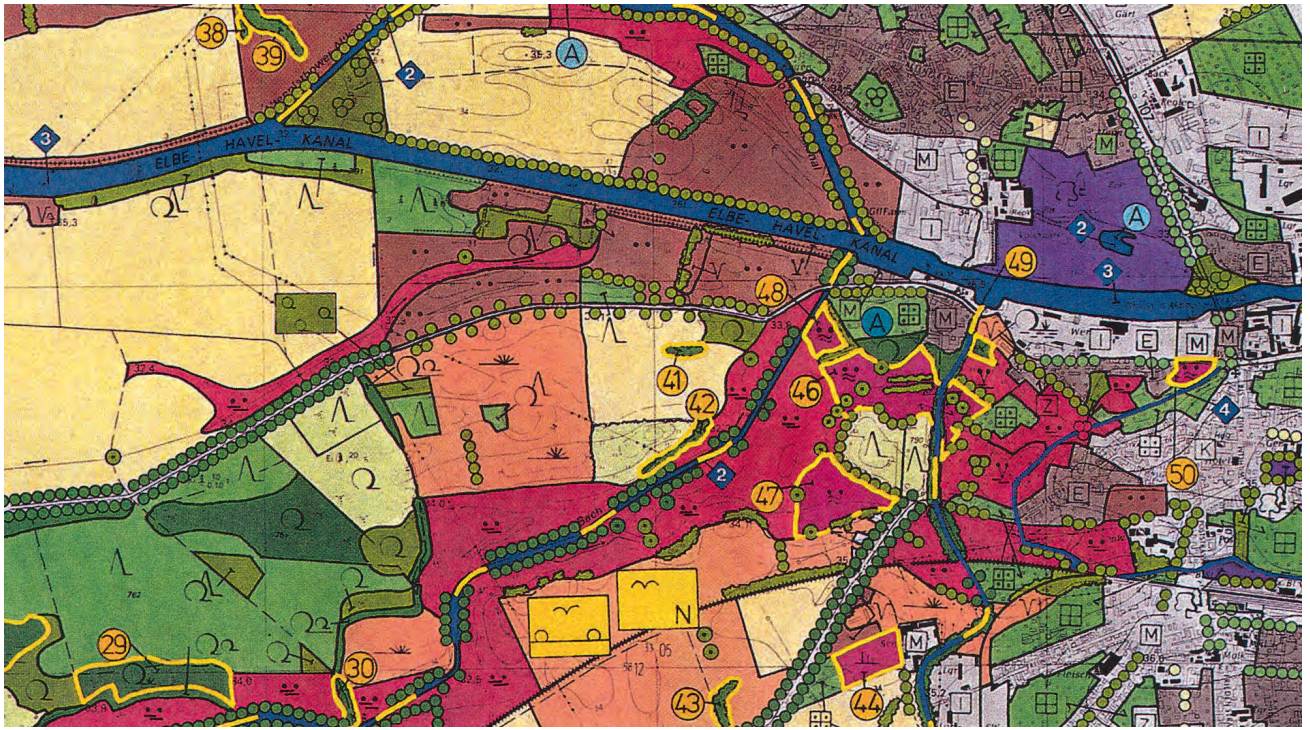
5. The quality of drainage streams should be maintained at least at German Water Pollution Class 2.

6. The quality of non-draining water bodies should be improved to the level of their natural trophicity /eutrophification.

7. Recreational use near water bodies should be improved in such a manner that water quality and bank conditions are preserved to the maximum extent possible.

8. Rehabilitation of drinking water sources affected by pollution, contamination and nitrate immission should be carried out.

Fig. 5. Map "Goals of Development" – A Portion of the Landscape Plan for the Havelland District (GfU, 2002).



Significance of biotopes for the protection of species and biotopes

Biotopes in open areas
- Degree of significance 1: very high significance
- Degree of significance 2: High significance
- Degree of significance 3 medium high significance
- Degree of significance 4 medium low significance
- Degree of significance 5 low significance

Complex of biotopes: shrubs, meadows, and water bodies (plant associations on bog embankments)
- Degree of significance 1

Groves and thickets
- Degree of significance 1
- Degree of significance 2
- Degree of significance 3
- Degree of significance 4

Water bodies
- Degree of significance 1
- Degree of significance 2
- Degree of significance 3
- Degree of significance 4
- Degree of significance 5

Residential areas
- Degree of significance 3
- Degree of significance 4
- Degree of significance 5

Non-built-up areas in or near residential areas
- Degree of significance 2
- Degree of significance 3
- Degree of significance 5

Protection of particular biotopes

Biotopes with special protection regime as per Article 30 of the Nature Conservation Act of the state of Saxony-Anhalt (cf. No. with the text of the landscape plan).

Fauna (birds)
- Richly structured lowland landscapes (complexes of biotopes with largely untouched deciduous, mixed and swamped woodlands, with richly structured water-swamp meadows, with water bodies, and their peripheral zones)
- Semi-open, richly structured landscapes
- Significant feeding places for the white stork
- Large, largely untouched, and largely open and swampy meadow landscapes with extensive utilisation of particular areas
- Resting places of migratory birds
- Dune and sand terrain landscapes

Fauna (amphibians)
- Especially significant water bodies used by amphibians for spawning
- Water bodies used by amphibians for spawning

Woodlands and thickets
- Bog forest
- Wetland forest
- Deciduous forest
- Mixed forest
- Coniferous forest
- Forest edge
- Orchard meadows
- Tree-lined avenues
- Groves
- Individual tree
- Hedges, shrubs, trees and shrubs along banks of streams

Biotope Complexes: Shrubs / meadows / water bodies
- -Plant associations on bog embankments

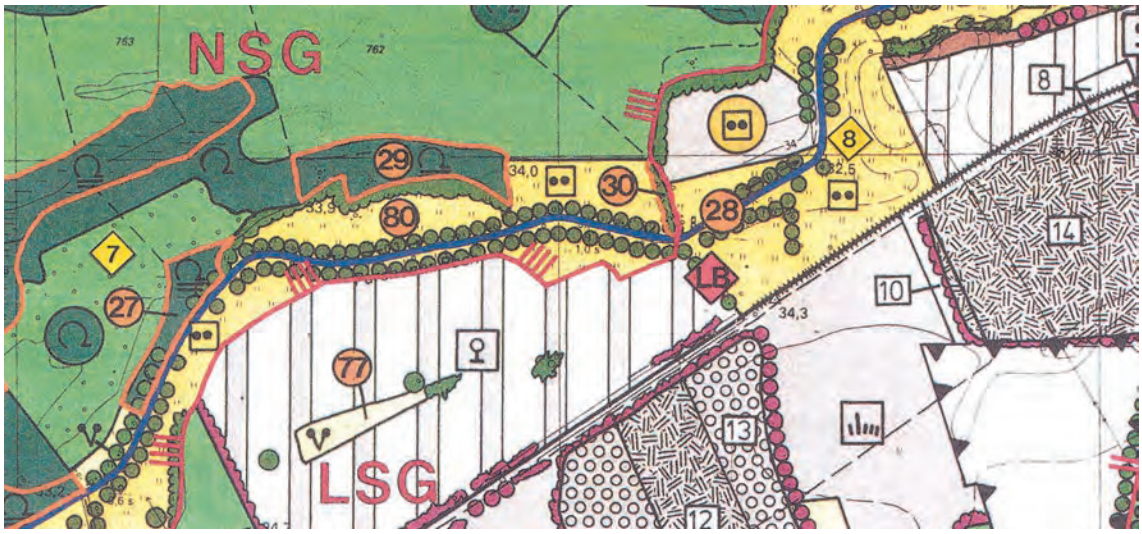
Biotopes in open areas
- Bog meadows
- Partly wet meadows
- Large, continuous meadows
- Pastureland with poor flora and fauna
- Extensive sand meadows
- Marshland with shrubbery and reeds
- Marshland with shrubbery
- Dry high grass with rich flora and fauna, with some dry valley meadowland
- Shrubbery in areas largely rich in biogenic elements, younger shrubbery
- Clear-cut areas
- Open areas with a high proportion of fallow farmland
- Largely intensively used farmland
- Extensive fallow land
- Tree nurseries, horticultural establishments

Water bodies
- Non-draining and other small water bodies
- Springs, ditches
- Old canals
- Segment of the Elbe-Havel Canal

Residential areas
- E Single-family housing
- M Mixed public housing
- Z Row housing
- G Large-scale estates
- K Village centres
- I Commercial area
- L Pollution control and water-management facilities; agricultural facilities; military use

Non-built-up areas in or near residential areas
- Parks
- Cemeteries
- Allotment gardens
- Large non-built-up areas with small gardens
- Children's playgrounds

Fig. 6. Map "Significance of biotope types for the protection of species and biotopes" part of the landscape plan for the town of Genthin (BDLA, 1998).



Key territories: protection, maintenance and development of nature and the landscape

Systems of protected areas

NSG -Natural protected area, planned

LSG -Protected landscapes, planned

LB -Protected landscape element, planned; surface/linear

ND -Natural monument, defined

Biotopes under protection

1 -Specially protected biotopes pursuant to Article 30 of the Nature Conservation Law

Key territories for measures on the protection and maintenance of nature and landscape

Wetland forests, water-protection measures

Near-natural status, mostly old deciduous and mixed forests of special significance as habitats

Wet meadows, special extensive utilisation

Meadows of special significance as habitats

Plant associations on bog embankments of special significance as habitats, and as parts of the historical cultural landscape

Forest glades

Edges of groves

Rows of trees

Hedges

Lentic water bodies; old canals; planting and maintenance of near-natural inshore vegetation

1 Protection-worthy areas

Key areas for measures on development of nature and landscape

Development of swamp and moist forests, removal of non-site-appropriate/ untypical vegetation on damp and wet soils

Development of near-natural status deciduous forests as central zones through modification of coniferous, deciduous and mixed forest stands

New planting of deciduous forests typical for this area (afforestations on farmland)

Establishment of succession territories (long-term development of forest on farmland)

Expansion of meadows for development of wet meadows with rich specific diversity

Key areas for recurring humidification of low-level bogs, improvement of the functions of nesting places for meadow breading birds

Conversion of farmland to extensive meadows with shrubs

Development of forest glades, fallow land, fallow/ forest glades

Planting of shrubs on developed forest glades, and fallow land

Additional afforestation; planting of rows of trees

Additional planting; installation of new hedges

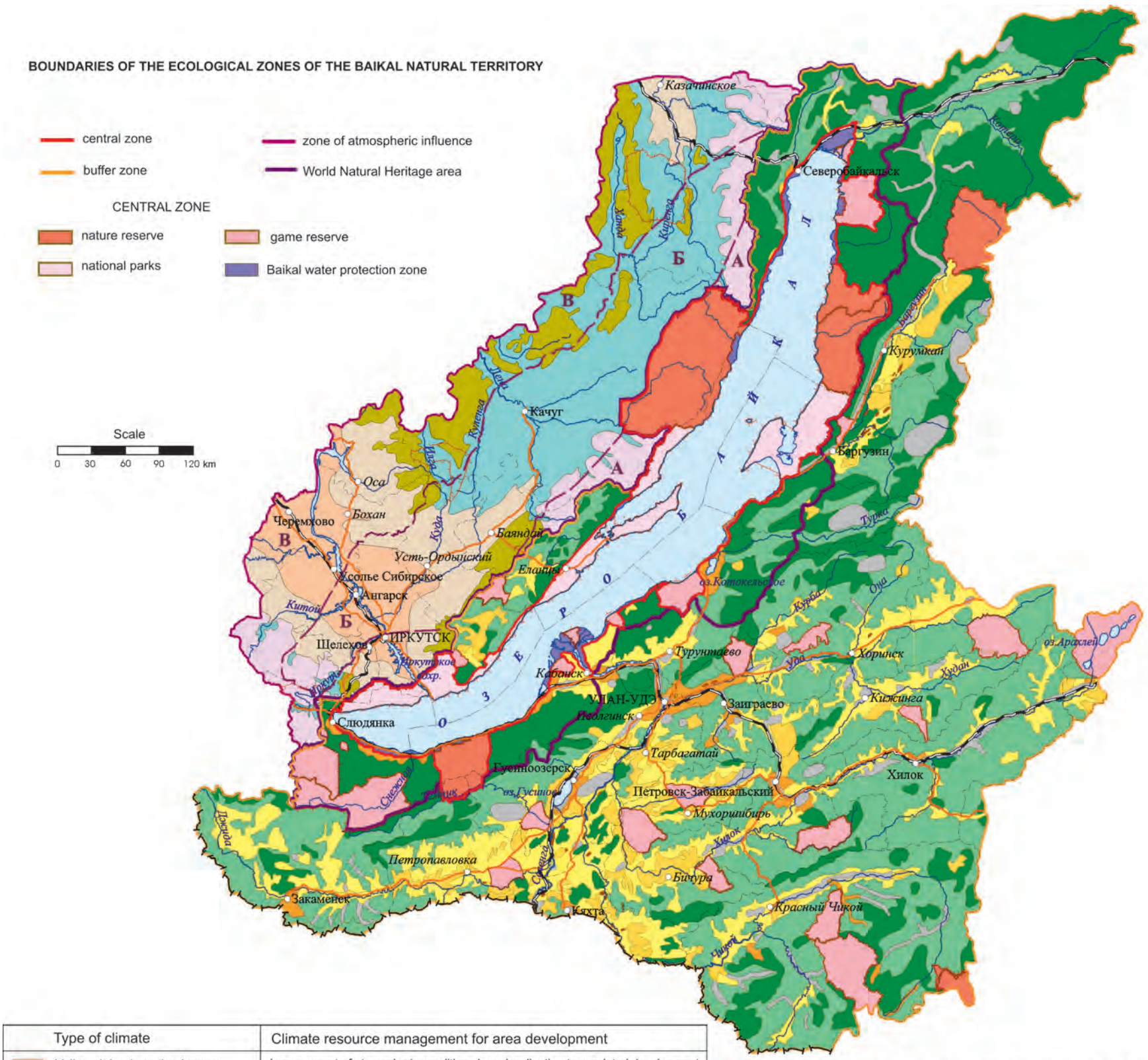
Rehabilitation and de-intensified maintenance of river banks

Development of unused banks to near-natural condition

1 Number of planned development measure

1 Territories established for compensation measures

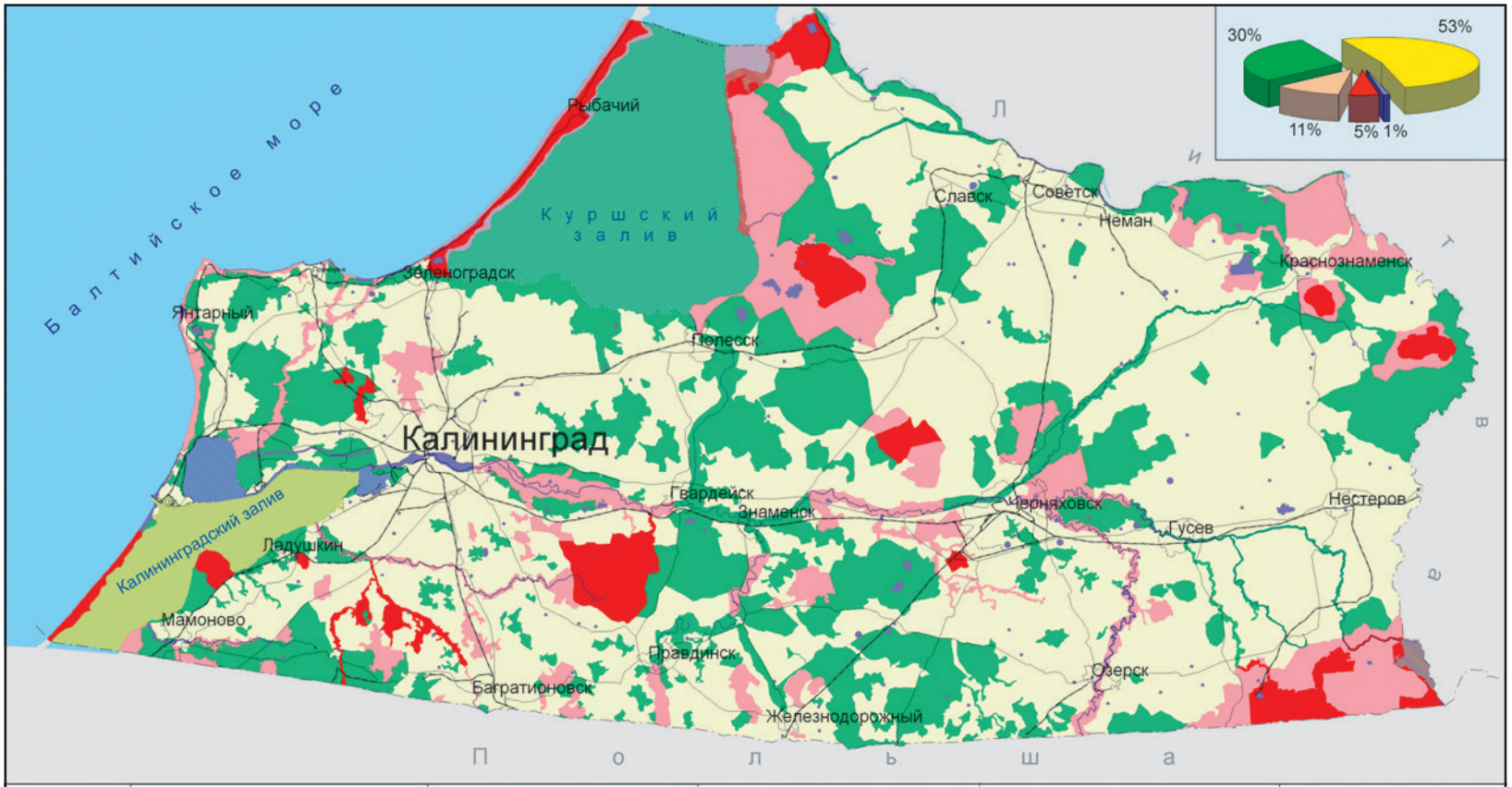
Fig. 7. Map "Key territories: protection, maintenance and development of nature and the landscape". A segment of the landscape plan for the town of Genthin.



Type of climate	Climate resource management for area development
Valley plain along the Angara	Improvement of atmospheric conditions by subordination to regulated development
Valley plain, piedmont	Regulated intensive development
Valleys and ravines	Extensive recreational and agricultural development
Plateaus	Conservation with development of existing extensive utilisation
Uplands and highlands	Conservation of present status, abandonment of utilisation

Subzones	Territories	Landscapes	Current utilisation	Projected utilisation
Protection conditions	Nature reserves	Mountainous: bald mountain and mountain-taiga	Abandonment of utilisation	Abandonment of utilisation
Reserve management	Game reserves, national parks	Bald mountain, forest-steppe, steppe, lake-swamp	Temporarily abandonment of utilisation	Recreation
Predominant conservation, not developed	Mountainous, remote from residential centres	Bald mountain, steep-sloping taiga lands-capes with pronounced steep-slope processes	Hunting-gathering, tourism	Recreation, hunting-gathering, eco-tourism
Existing economic management (largely forestry)	Forest	Mountain-taiga gently sloping uplands and low mountains, piedmont	Hunting and collateral forest utilisation	Forest utilisation with areas under protection as natural, historic and cultural monuments
Development of economic management (agricultural, transport)	Forest-steppe, near residential centres	Steppe valley floors, sub-taiga	Agriculture, livestock-breeding, transport	Development of existing sectors, construction of the gas pipeline and power transmission lines
Regulated intensive development	Major developed lands, deposits of mineral resources	Sub-taiga, piedmont steppe, valley	Industrial production, mining, transport, agriculture	
Improvement of the ecological situation in industrial centres	Industrial centres, erosion-threate-ned agricultural land	Valley transformed		Industrial, mining, transport
Re-afforestation, re-cultivation, and land amelioration	Lumbering and burnt out areas, mining, farmland	Taiga disturbed, valley transformed	Forestry and agriculture	Forestry, recreation, farming
Rehabilitation of landscapes to be placed under reserve management	Deflated sands, natural, historic and cultural monuments	Valley, deflated sands	Agricultural	Recreation, temporarily abandoned utilisation

Fig. 10. Ecological zoning of the Baikal Natural Territory.



Target	Mandatory onservation (territories and water bodies)	Predominant conservation (territories and water bodies)	Extensive development (territories and water bodies)	Intensive development (territories and water bodies)	Sanitation and recultivation (territories and water bodies
Significance	Unique and specially valuable nvironment-forming landscapes with high level of iodiversity, forming the basis of the Oblast's natural framework	Highly significant environment-regulating andscapes with ecosystems similar to natural ones, constituting a substantial part of the blast's natural framework with important components of biodiversity	Moderately significant, variously transformed territories and water bodies, important for maintaining stability of ecosystems and ensuring the environment-forming function, playing the role of ecological corridors and refuges	Low-significant territories at different stages of anthropogenic transformation of landscape, with predominance of agricultural lands	Disturbed territories at the stage of strong anthropogenic transformation or degradation of landscape
Measures recommended	Organization of SPNT of high protection status, predominantly on a federal level	Creation of regional- and local-level SPNT	Ecologically oriented nature management. Runoff control, and formation of subsurface and surface water high quality	Different forms of nature management. Increasing woodland area, development of agriculture with due regard for landscape structure and by introducing environmentally safe technologies, improvement of soil fertility, and measures of disturbed land recultivation	Restrictions or cessation of economic activities
Admissible kinds of activity	Scientific research and environmental.In some cases, under SPNT regime, allotment of limited zones for ecologically oriented recreational utilization is admissible	Scientific research and environmental.In some cases, under SPNT regime, allotment of limited zones for ecologically oriented recreational utilization is admissible	Extensive tapping of natural resources; ecologically oriented forest utilization and agriculture, hunting, fishery, and recreation	Agriculture, development of residential centers and transport infrastructure; industrial construction; agrotourism	Restoration measures with a ubsequent placing of territory into the "conservation" or "development" category

Fig. 12. Target map for ecologically oriented utilization of territory of Kaliningrad Oblast.

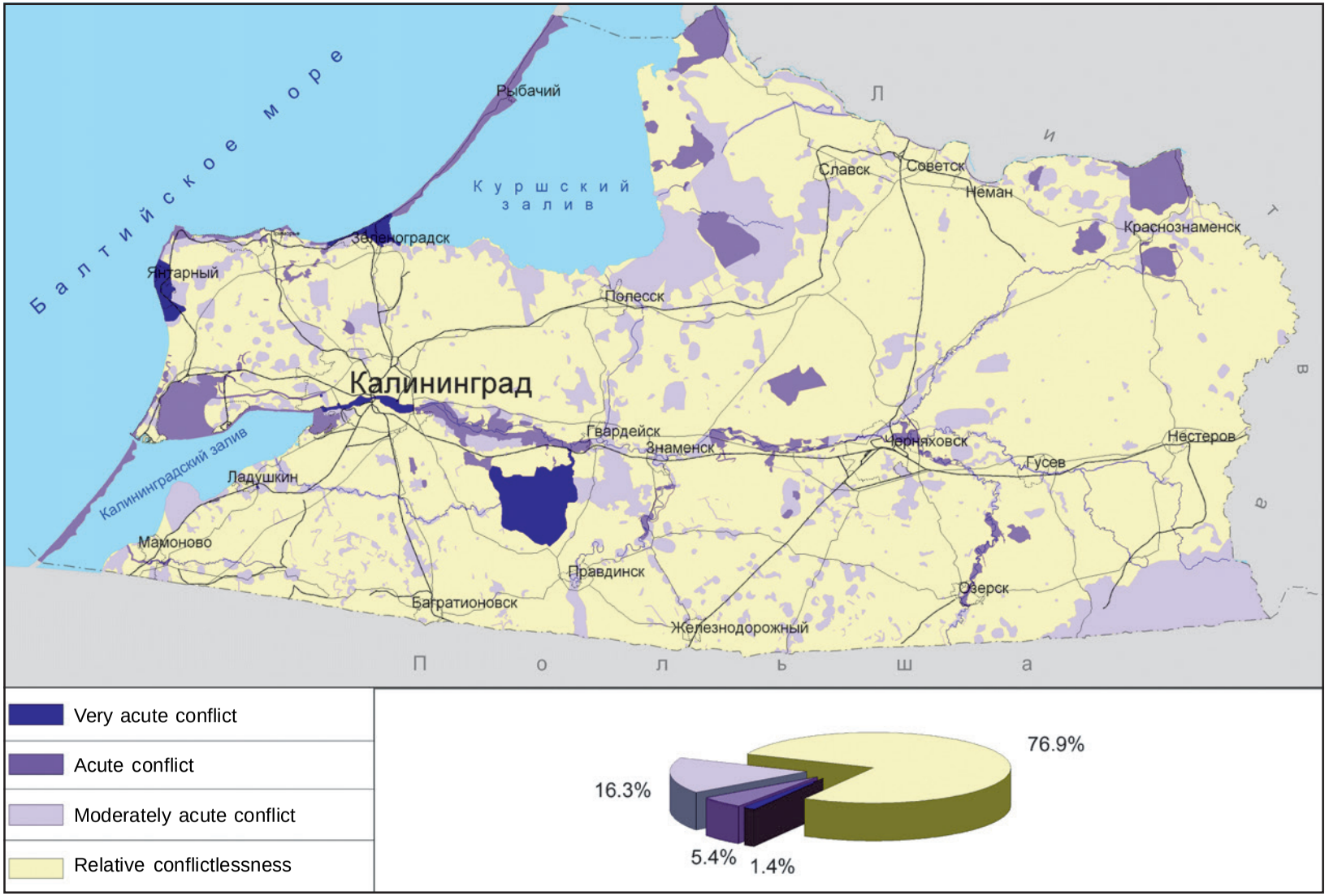


Fig. 13. Nature management conflict map for Kaliningrad Oblast.

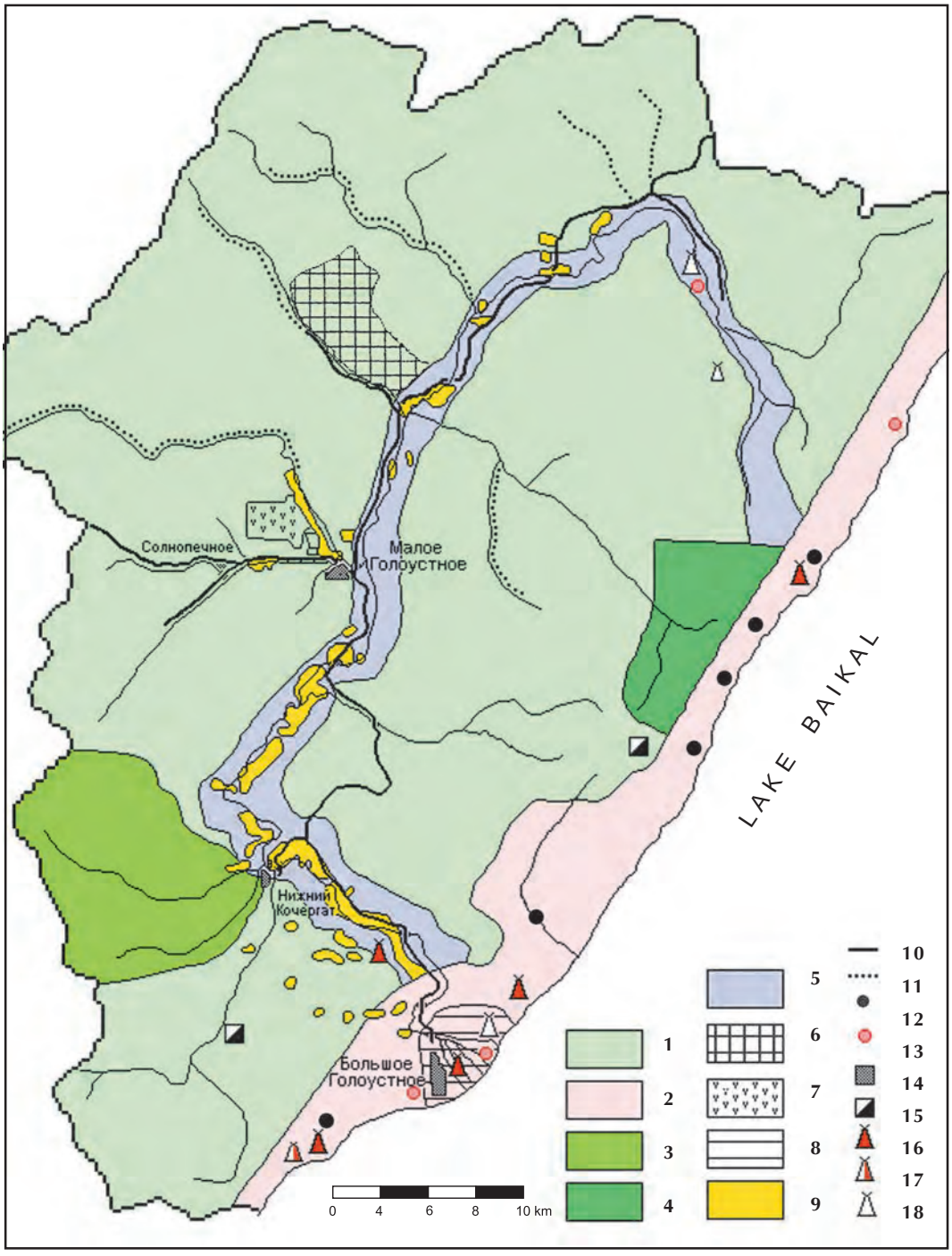


Fig. 15. Actual land utilisation.

Forest areas: *specially protected by the State:* 1 – Pribaikalsky State Natural National Park; 2 – Kochergat Satte Sable Preserve of regional significance; 3 – Zone of Siberian stone pine harvesting; 4 – Restricted spawning and water-protection strips along the banks of the Golustnaya river; *others, assigned to Category I (Baikal water-protection zone):* 5 – Collateral forest utilisation; 6 – Maral (Siberian snag) breeding farm.

Agricultural areas: 7 – Subsidiary holding of the Forestry Directorate; *community-owned pasture-hayfields:* 8 – Grazing lands; 9 – Hayfields. Roads: 10 – Category IV state road (local significance), and departmental main logging crowned roads; 11 – Main winter motor roads.

Separate natural and cultural sites: 12 – Natural monuments and interesting places; 13 – Historic and cultural monuments.

Residential centres and temporary dwellings: 14 – Urban and rural settlements; 15 – Facilities of the training hunting grounds of the Irkutsk State Agricultural Academy; Tourist centres and seasonal refuges: 16 – active; 17 – projected; 18 – unorganised camping sites.

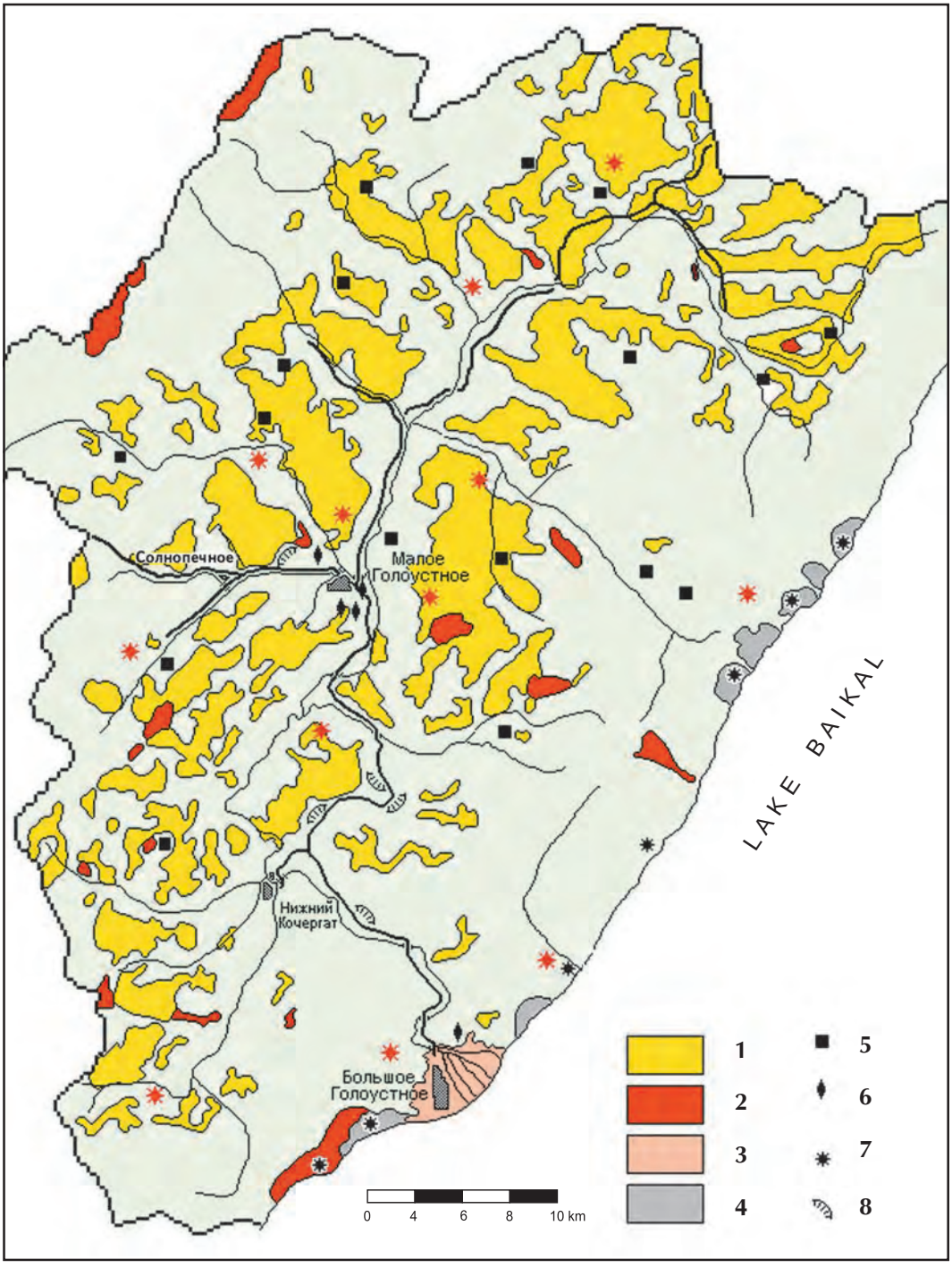


Fig. 16. Anthropogenic Transformation of the Area.

1 – continuous concentrated and strip-like tree felling areas dating from different times; 2 – burned areas; 3 – degradation of soils and plant communities due to overgrazing; 4 – degradation of soils and plant communities due to uncontrolled recreation; sites of former and existing production areas for wood processing, and for the upper and lower timber yards; household waste sites; 7 – areas of soil cover substantially damaged at camping sites; 8 – quarries.

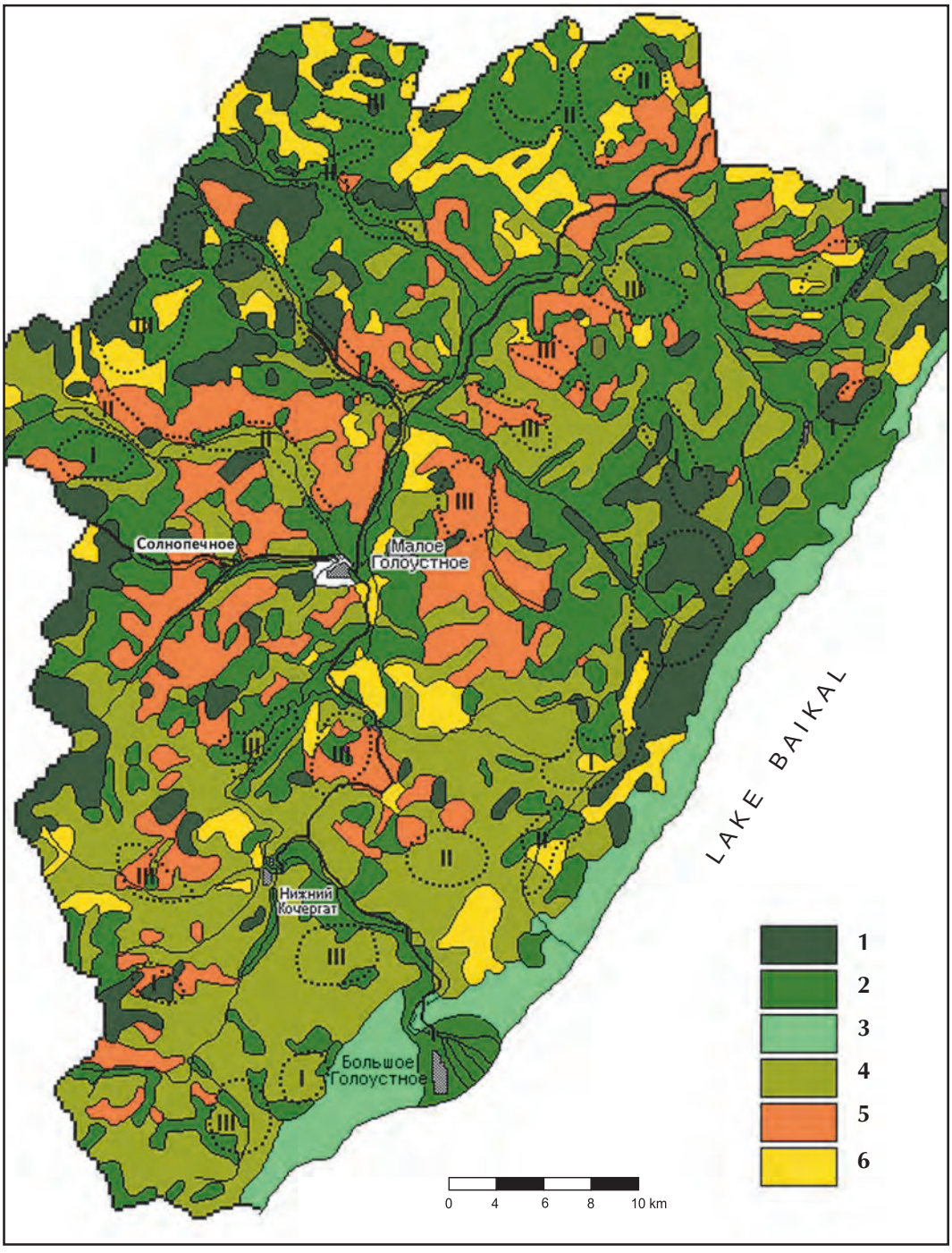


Fig. 19. Significance of species and biotopes.

Significance of Biotopes:

Very high: 1 – Mountain-taiga native poly-dominant dark-coniferous moss-dwarf shrub with some light-coniferous and small-leaved species that provide important reproduction places for fur-bearing animals and survival areas for wild hoofed animals during deep-snow winters;

High: 2 – Mountain-taiga light-coniferous larch and pine, largely grass-herbage and dwarf shrub. On gentle hill slopes and flat interfluves; valley forest larch with some birch and spruce, grass-herbage, concurrent with meadow and shrub, favourable for roe, blue magpie, birds of prey, and rare bat species; *yernik* composed of shrub species concurrent with swamp sedge-sphagnum with some pine and birch, providing winter feeding areas for hoofed animals, habitat for near-water fowl; steppe with rich herbage-grass, favourable for transient birds of prey; meadow-swamp for nesting by rare birds, and habitat of the muskrat;

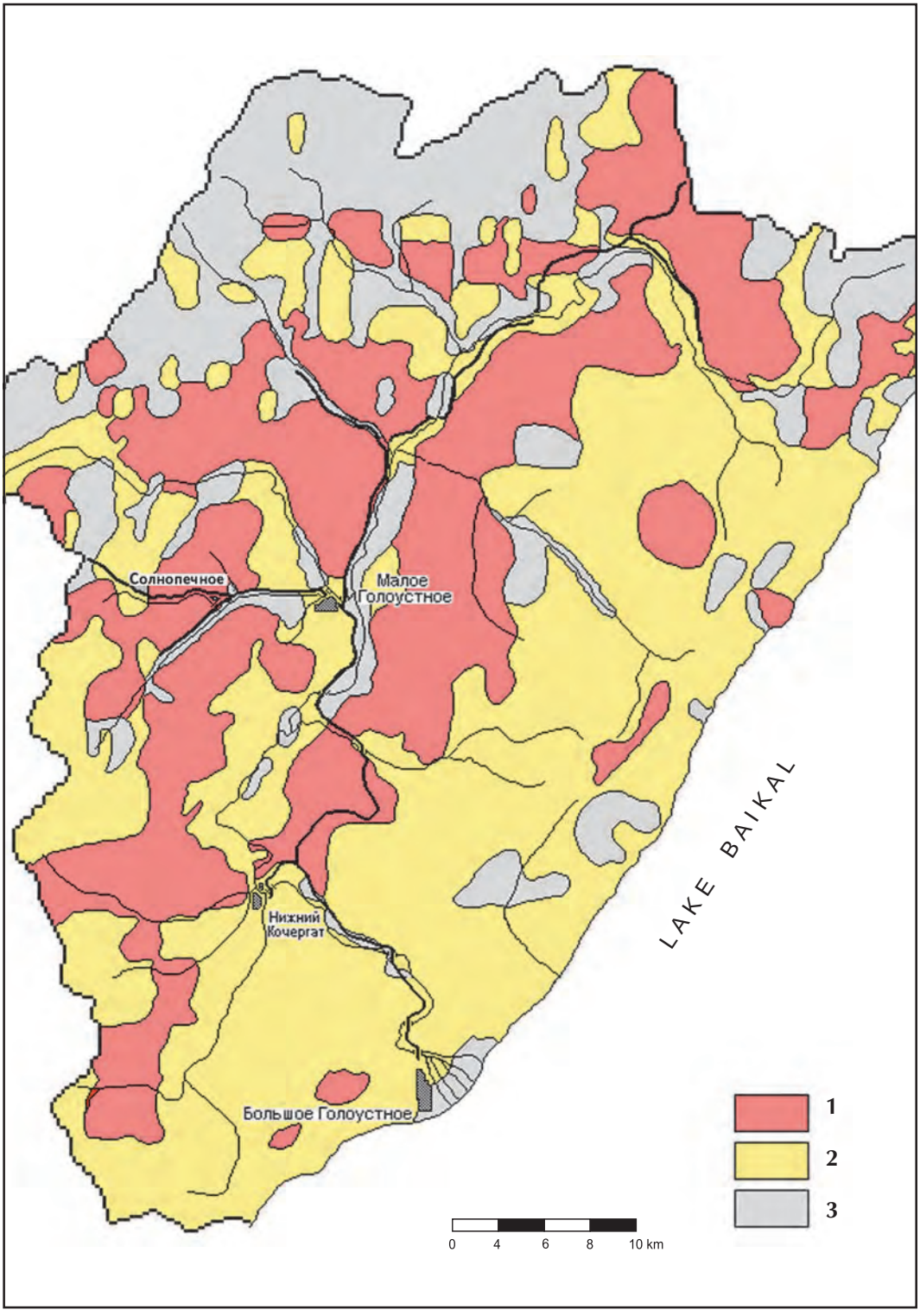


Fig. 20. Sensitivity of Biotopes.

1 – high, 2 – moderate, 3 – low

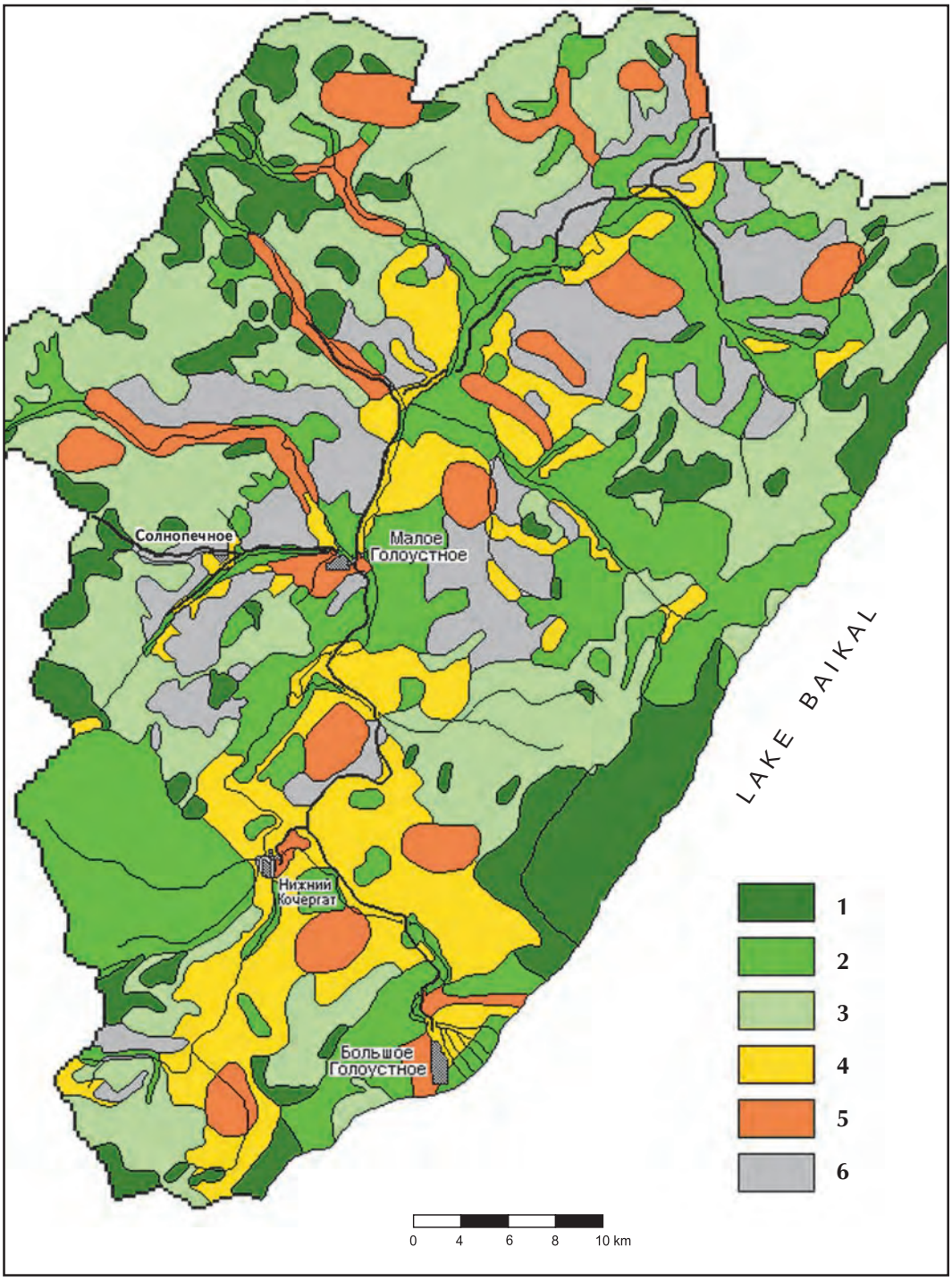


Fig. 23. Spatial development goals for species and biotopes.

Largely Preservation of the Current Status / Utilisation

1 – *Abandonment of utilisation.* Pine and larch-pine biotopes on slopes highly significant for the habitat and reproduction of valuable and rare plant and animal species, high significance mountain-taiga native dark-coniferous, largely Siberian stone/ pine biotopes, including young biotopes highly sensitive to forest fires;

2 – *Preservation of the existing stable extensive utilisation or assignment to this category.* High significance forest and forest-steppe biotopes in the Lake Baikal shore area and adjacent slopes favourable as seasonal habitats for valuable hoofed animals, birds, and insects, including rare species, as well as rare plant species; mountain-taiga light-coniferous and dark-coniferous biotopes of the Kochergat State Nature Reserve designed for the renewal of valuable fur-bearing and other animal species, moun-

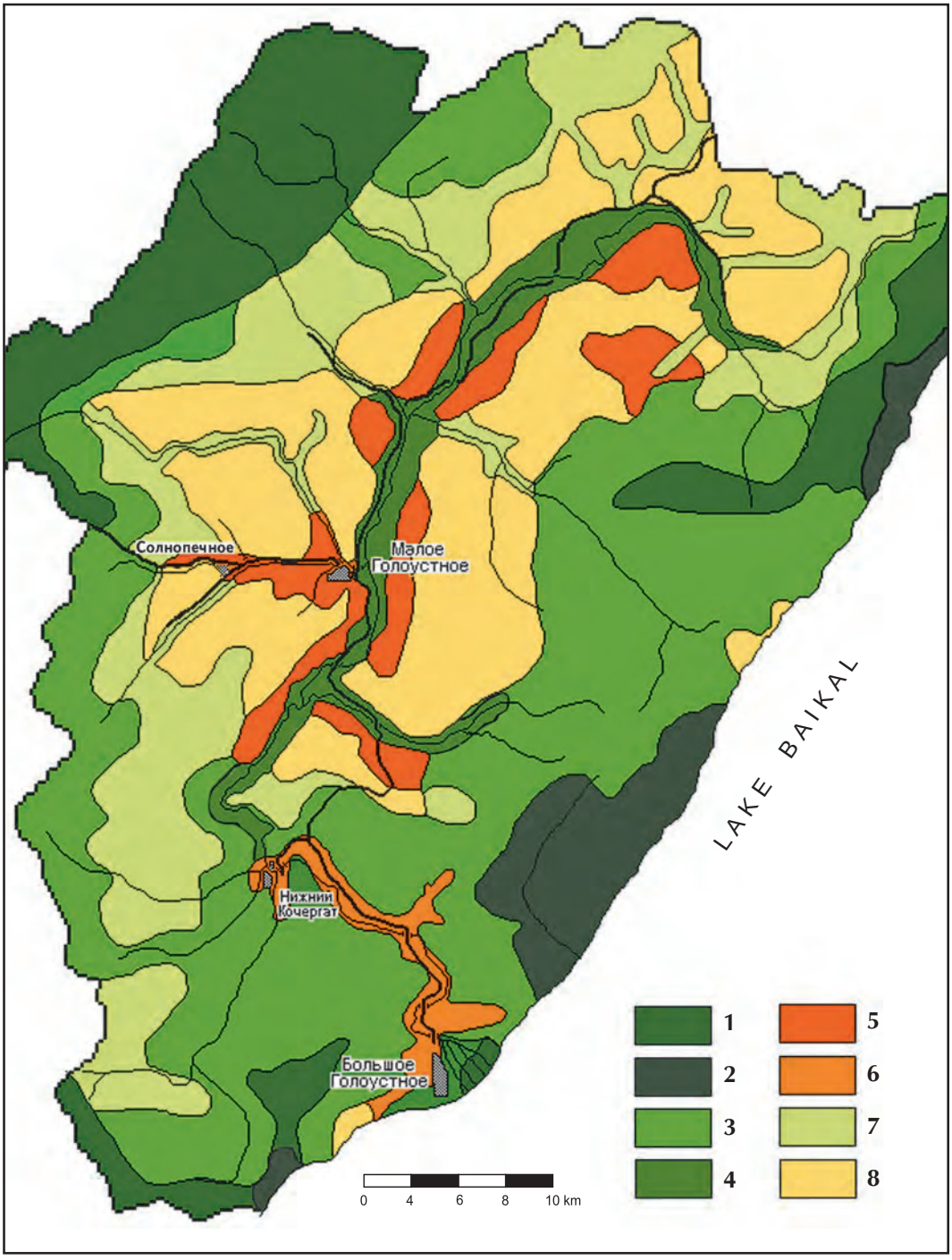


Fig. 25. Integral Goals of Spatial Development.

Primarily Preservation of Current Status of Utilisation:

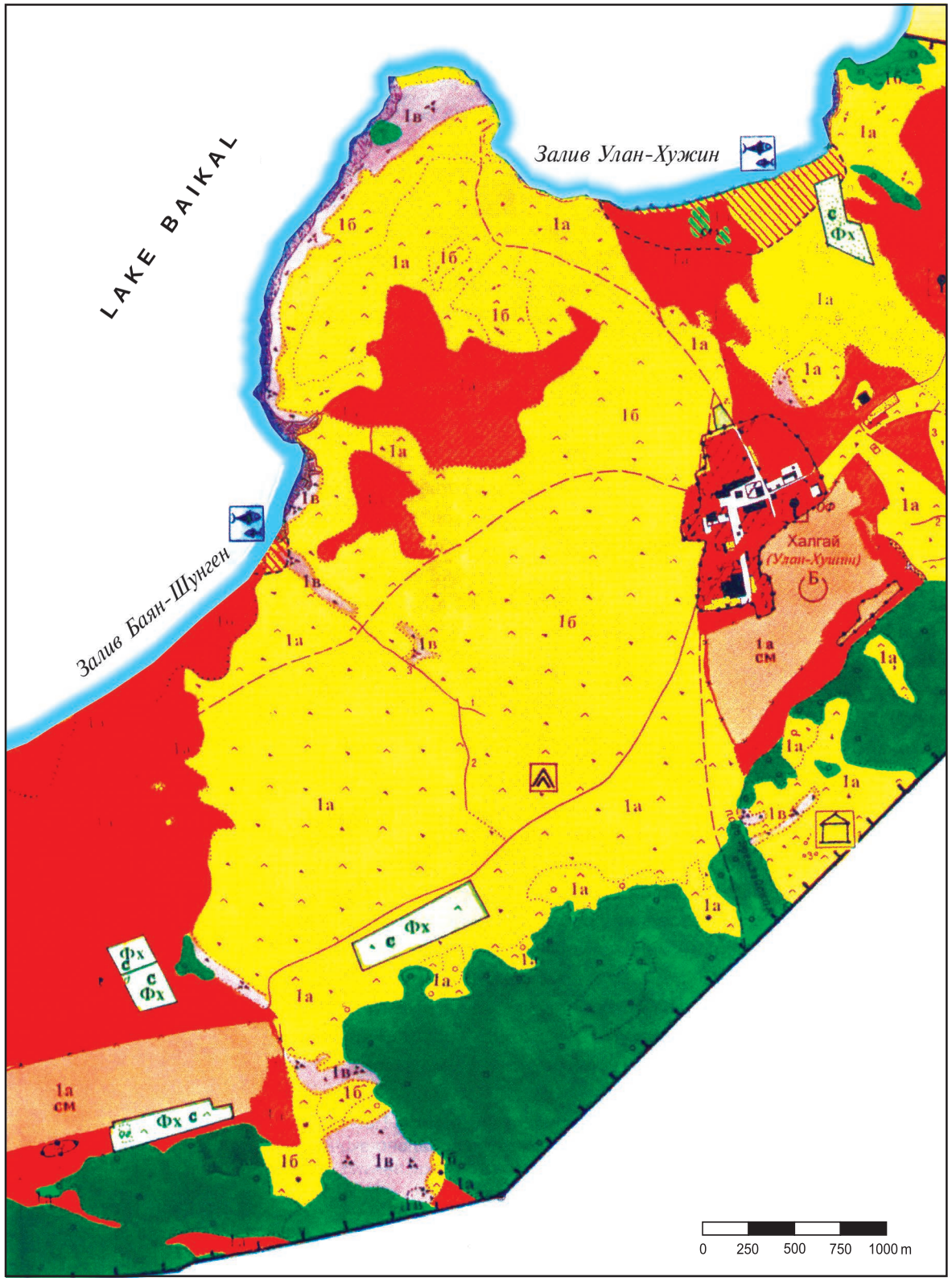
Abandonment of utilisation:

1 – High significance and high sensitivity watershed surfaces with Siberian stone pine forests. Environment-shaping core. Reproduction of valuable plant species. Animal habitats and reproduction for the taiga ecological group, including principal game species. High flow-forming potential;

2 – High significance and high sensitivity slope areas along Lake Baikal. Environment-shaping landscapes of the Baikal basin of a high aesthetic value;

Preservation of existing sustained extensive utilisation or assignment to this category:

3 – High and moderate significance, moderate sensitivity taiga, largely moss, forests on the slopes of different steepness. Multi-functional buffer zone with nature-protective and special functions. Provides protection for the environment-shaping core. Flow-forming and flow-regulating functions (basic runoff formation of the area);



Agricultural lands under village administration, In the residential centres, OOO "Olkhonskoye"

Cultivated lands

Kitchen-gardens

Haylands

Grazing lands (land reserves)

Clean

Disturbed (with crushed stone, boulders, forest stands, and shrubs)

Heavily stony, used to only a small extent

Quality and significance of lands

Generalised productivity score of the plot

	Ploughed land	Hayland	Rangeland
1. Low	to 20	to 8	to 3

Significance assessment of the user's plot

General for productivity
a Good/ satisfactory
b Medium/ low
c Below medium/ very low

The numerical value of one score for cereals (ploughed land) 0.44; for haylands 0.8; for rangelands 0.6

Land users

Фх Farming

Non-farming land users

Legal status of agricultural lands

C Private property

CM Mixed (shared property and use)

Forest and shrub-land

Forest stands

Thin forest

Natural rock outcrops

Crags and screes

Sands

Landslides

Ethnic population structure

Predominant population

Б Buryats

Cultural Monuments

Existing sites of worship

Datsan (Buddhist temple)

Clan serge (tethering post representing the tree of life and combining tree worlds, used for binding of the horses of the supreme celestial beings, the horses of common earth people and other mystical beings)

Obo (holy shaman place)

Anthropogenic stresses

Unorganised recreation areas

Unorganised fishing

Water stress induced by recreational use

Other conventional signs

Thickly forested

Stony surfaces

Clusters of stones

Water wash

Boundaries

Pribaikalsky National Park

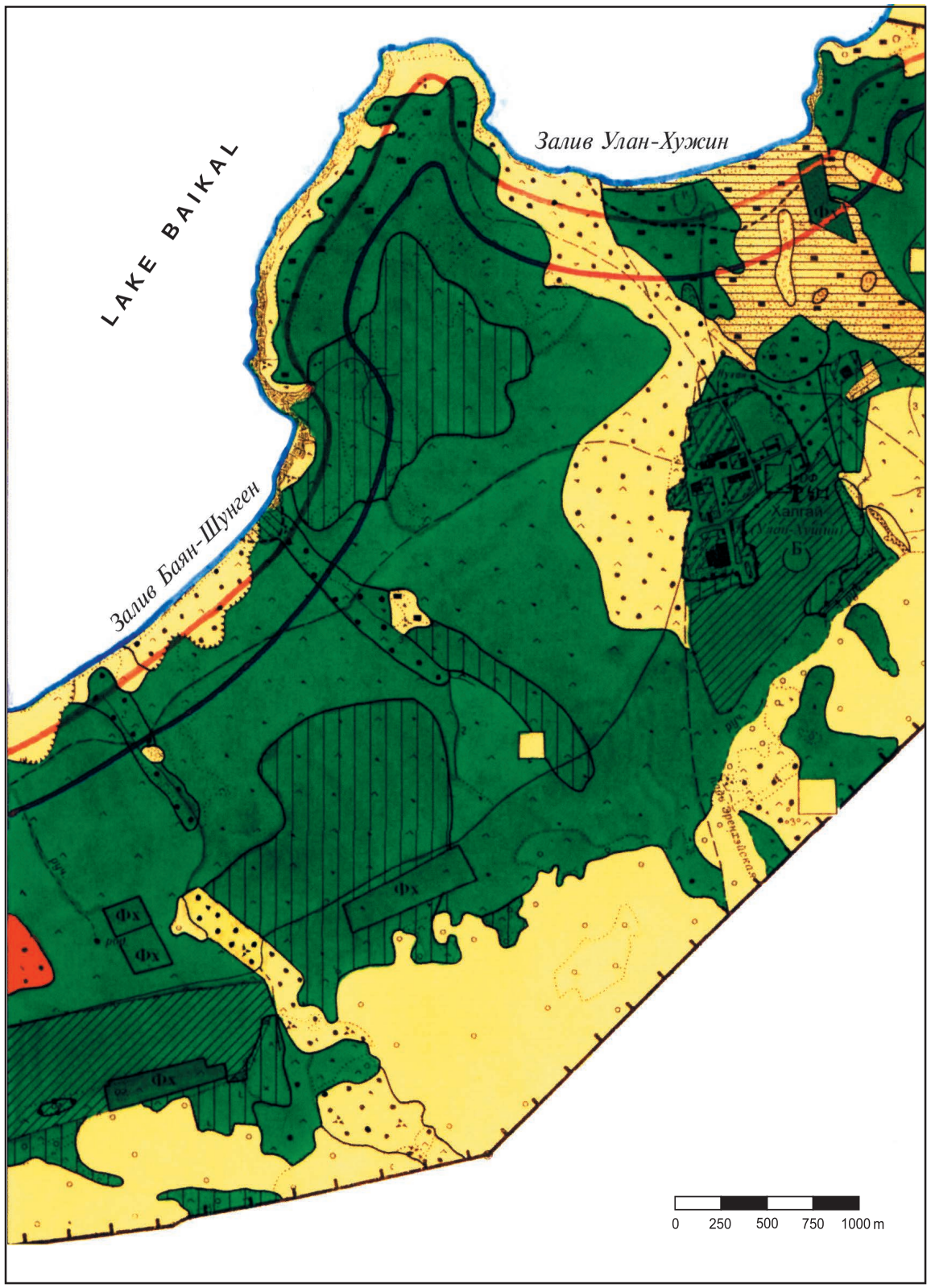
Lands forming part of the Park without termination of agricultural operations

Lands under rural and village administration

Land users

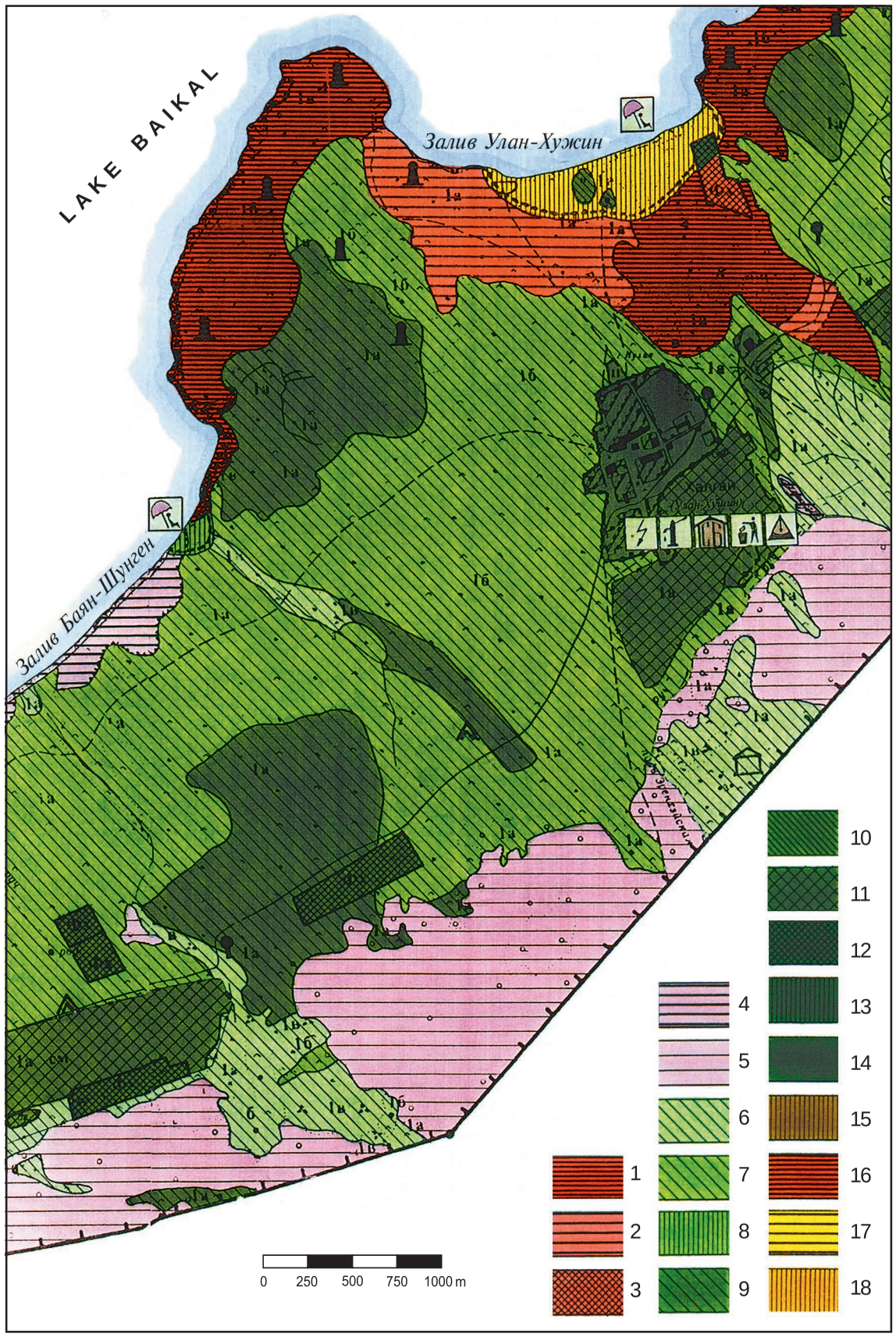
Agricultural lands

Fig. 27. Actual land use. A portion of the map for the Olk hon district.



Economic Function of the Area	Action and Measures
CONSERVATION	
recreational	Restriction on activity; identification of conservancy and cultural heritage sites; adherence to regulations of and requirements for their conservation
	Infrastructure of recreational places
Forestry	
Human recreation	Educational-aesthetic, hiking and ecological tourism Regulation of the number of vacationers; forest-clean-ups; setting up of micro-reserves for species on the Endangered Species List Regulation of the number of vacationers; elementary infrastructure in the area
Forest products, soil-protection, water-protection	Measures for forest care and protection
SOCIAL	
Burial places	Bringing burial places in line with sanitary and aesthetic standards Utilisation of extensive technologie
Ritual and worship places	
DEVELOPMENT	
Output of crop produce	Utilisation of intensive technologies in compliance with ecological standards
	Extensive development
Obtaining natural hay for forage	Restriction on herd grazing
Provision of farm cattle with pasture forage	Farming management
	Social Regulation of the pasturing regime and of the number of pasturing animals in a herd Increasing productivity of agricultural land through additional surface sowing of grasses
Farming	Observation of ecological regulations on livestock-breeding and crop-growing
Social	Expansion and infrastructure of human settlement
	Electric power supply Water supply Introduction of the social infrastructure
	Aesthetic; setting up of micro-reserves for species on the Endangered Species List
REHABILITATION	
Nature reserve	Prohibition of all kinds of economic activity

Fig. 31. Action and measures. A portion of the map for the Olkhon district.



boundary of the areas recommended for removal from the agricultural category

location of the zones of archaeological sites supported by a sufficient exploration, where protective measures are required

Recommended measures for the infrastructure of human settlements and seasonal cattle farms

Sustained supplies of

electric power

water

infrastructure services to residents:

travel

consumer services

solid and liquid waste disposal

Infrastructure of:

greenbelts

recreational areas

balneological places

hydropathic and therapeutic mud-baths under construction

modernisation of fish-breeder

Development of

projects for processing agricultural produce

projects for processing forest products

projects for marble quarrying and processing

purchasing organisations

projects for manufacturing horse-farming and equestrian sport equipment

museums

Fig. 34. Integrated goals of spatial development. Functional zoning. A portion of the map for the Olkhon district

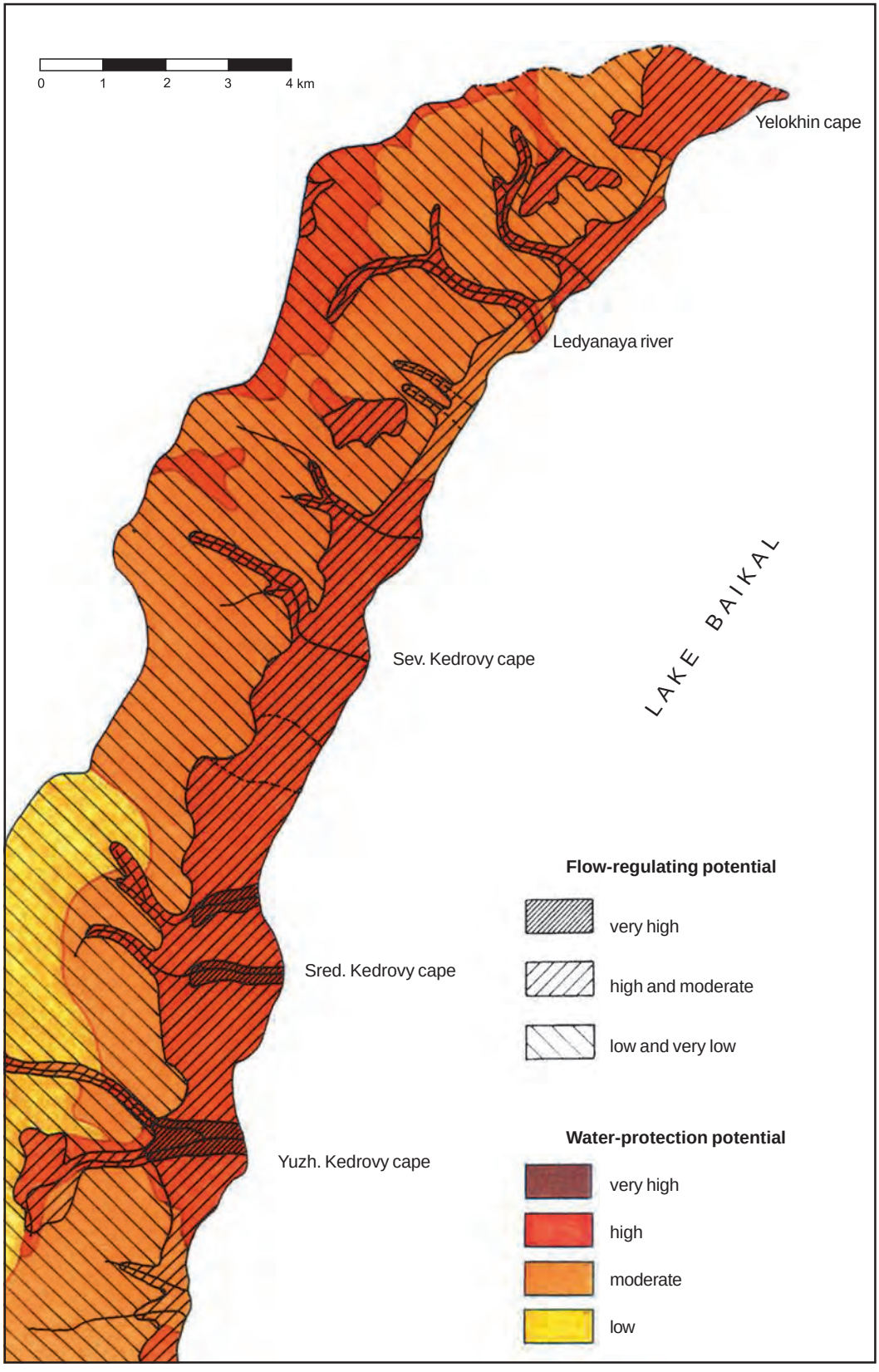


Fig. 36. Functional configuration of the Lake Baikal water-protection zone in a section of themap of the Olkhon district.

Water-protective potential of subsurface water		Characteristic of the degree of protection of subsurface water
	Very high	Very low recharge rate of subsurface water, with very high or high infiltration flow rate
	High	Very low and low recharge rate of subsurface water, with high infiltration flow rate
	Moderate	Low and moderate recharge rate of subsurface water, with high and moderate infiltration flow rate
	Low	Moderate and high recharge rate of subsurface water, with moderate and low infiltration flow rate
	Very low	Very high and high recharge rate of subsurface water, with very low and low infiltration flow rate
	Permanent streams and water-protection zones Temporary streams and water-protection zones	Water-protection zone boundary On-shore-protection band of Lake Baikal
	Boundary of the Central Ecological Zone under the Law “On Protection of Lake Baikal” (draft)	
	Boundary of the projected suburban zone	
	Railroad	Federal motor road Power trans-missionlines

Zones of spatial development		Brief characteristic of the zones	Nature management guidelines
	Retention of existing state	Flow-forming and water-protection natural-spatial complexes, typically dark-coniferous, steep-hillside, wet near-channel and swamp complexes along Lake Baikal shore area	Conservation of existing landscape structure and its integrity; Abandonment of activities leading to a disturbance of soil cover and surface runoff.
	Intensive development	Small-leaved, sparse-forest natural-spatial complexes and vacant plots of land on plain and gently-sloping surfaces, not drained by streams, with high and moderate seepage and sorption properties of soils	Impacts on landscape-hydrological complexes must allow for the recovery of the water balance over the range of its natural variations
	Extensive development	Small-leaved and sparse-forest natural-spatial complexes on surfaces with moderate gradients, and with high and moderate water permeability of soils	Impacts on landscape-hydrological complexes must be regulated, with due regard for anti-erosion measures; collection and removal of pollutants, with the total blockage of entry to the soil surface ; Landscape planning with due regard for the water factor in areas of planned development
	Retention of existing utilisation with elements of improvement	Industrial/commercial areas with a high level of disturbance of natural-spatial complexes and pollution that provide the sources of pollutants entering streams and subsurface water	Recovery of qualitative and quantitative characteristics of surface and subsurface water, to approach original characteristics; Environmental optimality of residential and industrial development processes; Observance of the water-protection zoning criteria when siting horticultural cooperatives and recreational areas; Prohibition of siting of pollution sources without prior measures to cut off seepage routes into surface water bodies and aquifers.

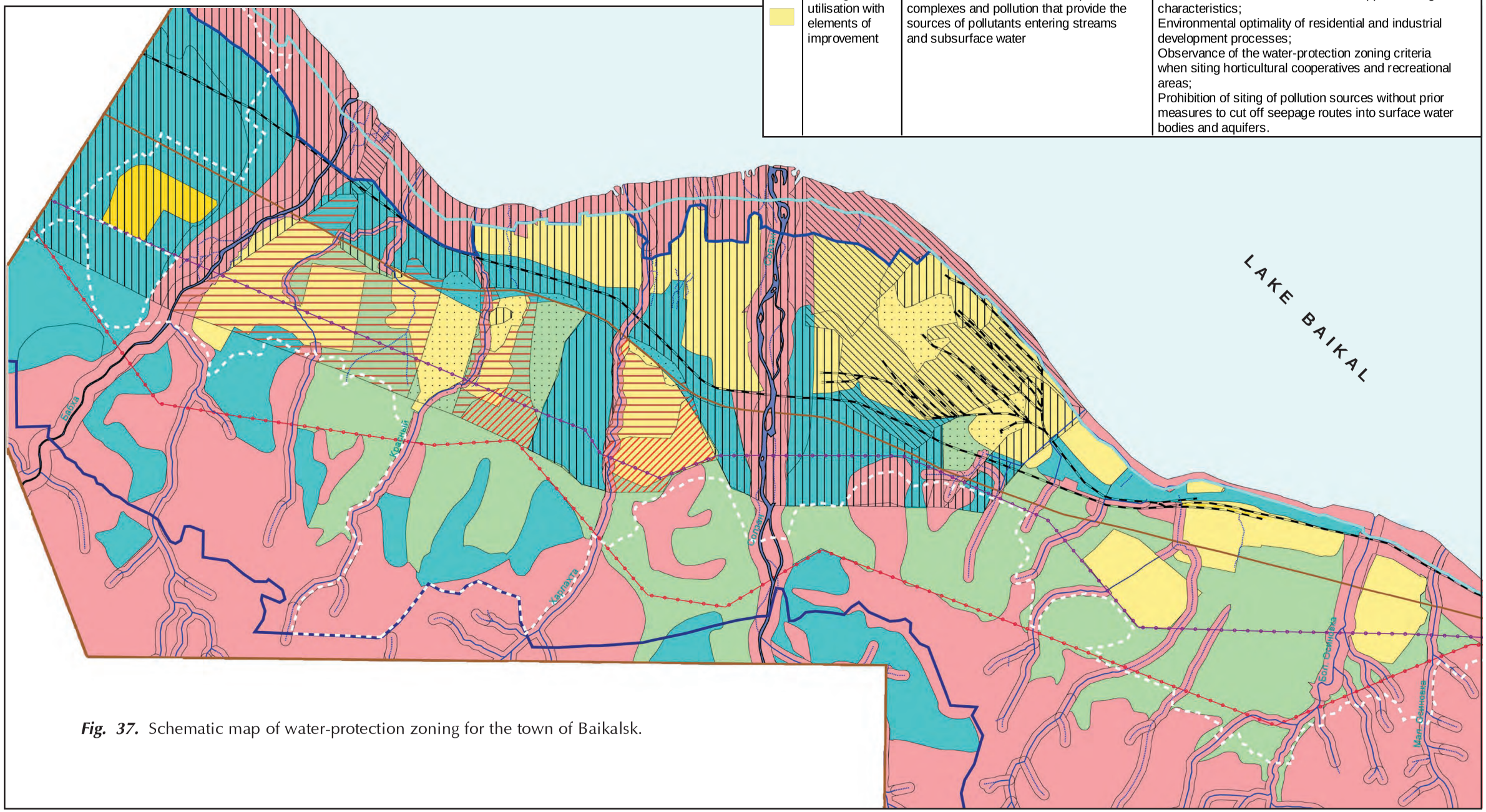


Fig. 37. Schematic map of water-protection zoning for the town of Baikalsk.

POPULATION AND LABOR RESOURCES

LEGEND

Share of the population of employable age, %

50 - 60
40 - 50
30 - 40

Permanent residents
Temporary residents

1 cm of the diagonal of the semicircle corresponds to 1000 persons

SCALE 1:400,000

DEVELOPMENT OF THE SOCIAL SPHERE

LEGEND

Expenditures connected with the social sphere, rbl/person

Over 10,000
7,500-10,000
5,000-7,000
2,500-5,000
Less than 2,500

SCALE 1:400,000

RECREATION POTENTIAL

LEGEND

Assessment of recreation potential

high
moderate
low

Areas and priority lines for the promotion of recreation and tourism

I Pereslavl historical and cultural tourism
II Pleshcheyevo natural-ecological, sports/fitness and cultural tourism
III Aleksino-Smolensk excursion-educational, rural and natural tourism
IV Novo-Glebovsky rural, natural and cultural tourism
V Dubrovitsky rural and sports-fitness tourism
VI Borodinsky rural and natural tourism
VII Kubrinsky natural-ecological and sports-hunting tourism
VIII Nagorievsky excursion-educational, natural and rural tourism
IX Dmitrievsky self-driving, natural and sports-fitness tourism
boundaries of the areas

SCALE 1:400,000

ECOLOGICAL SITUATION

LEGEND

Share of protected natural areas in the surface area of rural communities, %

over 50
20-50
10-20
less than 10

Area of protected natural areas and sanitary zones

national park
sanctuaries
sanitary zones
water-protection zones

1 mm of the height of the diagram corresponds to the area of 3.3 sq. km

SCALE 1:400,000

MINERAL DEPOSITS

Fuels:

Peat

over 1000 ha
less than 1000 ha
peat extraction boundaries

Building materials:

sand, 1000 cu. m

less than 500
not requiring additional exploration
requiring additional exploration

sand-gravel mixture, 1000 cu.m.

less than 500 — not requires no additional exploration
more than 500 — requires additional exploration

clay, molding loams, 1000 cu.m.

less than 500
more than 500 — not requires no additional exploration

AGRICULTURE

Specialisation of agricultural enterprises

dairy farming
dairy farming, fodder production
beef and dairy animal husbandry
beef and dairy animal production, fodder production
beef and dairy animal husbandry, grain production
beef and dairy animal husbandry, grain production
grain production, dairy farming, pig-breeding, sheep-breeding
flax growing plus growing of vegetables, fodder production

Level of intensification and effectiveness of production

very high
high
moderate
low
bankrupt enterprise

Structure of agricultural lands

arable land
pastures
hayfields

1 mm of the height of the diagram corresponds to 100 ha of agricultural lands

Caption to the diagram total area of agricultural lands of the enterprise, ha

BRANCHES OF INDUSTRY AND TERTIARY INDUSTRIES

Primary sector

extraction of building materials (gravel and sand)
extraction of peat

Secondary industry

Machine building and metal working

production of metalware
repairs of agricultural equipment
production of accessories for air heaters

Chemistry of polymer materials

processing of plastics

Forest and woodwork industry

logging and pre-processing of timber
pre-processing of timber
production of packing materials of corrugated board

Civil construction

road building
industrial and social facilities

Light industry

pre-processing of flax
clothing
production of labels and stickers
production of packing material

Food industry

baking
beef
dairy
cheese

Tertiary industry

commerce
transportation services
catering
tourist services
hair-dressers
trade in fuels and lubricants

Crafts

arts studio

LANDS WITH CONSTRAINTS ON USE

Game reserves

Lake Pleshcheyevo National Park

Functional zones of the National Park

rehabilitation sub-zone
sub-zone of protected natural landscapes
zone of educational tourism
zone of protection of historical and cultural sites
recreation zone
zone of servicing visitors
zone of economic utilisation

Boundaries of the National Park

Other lands

lands of glf
woodless terrains
wetlands

RESIDENTIAL CENTRES

population, persons

over 1000
300-1000
100-300
30-100
10-30
less than 10
no permanent residents

TRANSPORT ROUTES

railroads

Motor roads:

highway No. M-8
asphalt
paved
not paved
oil pipeline
gas pipeline

BOUNDARIES:

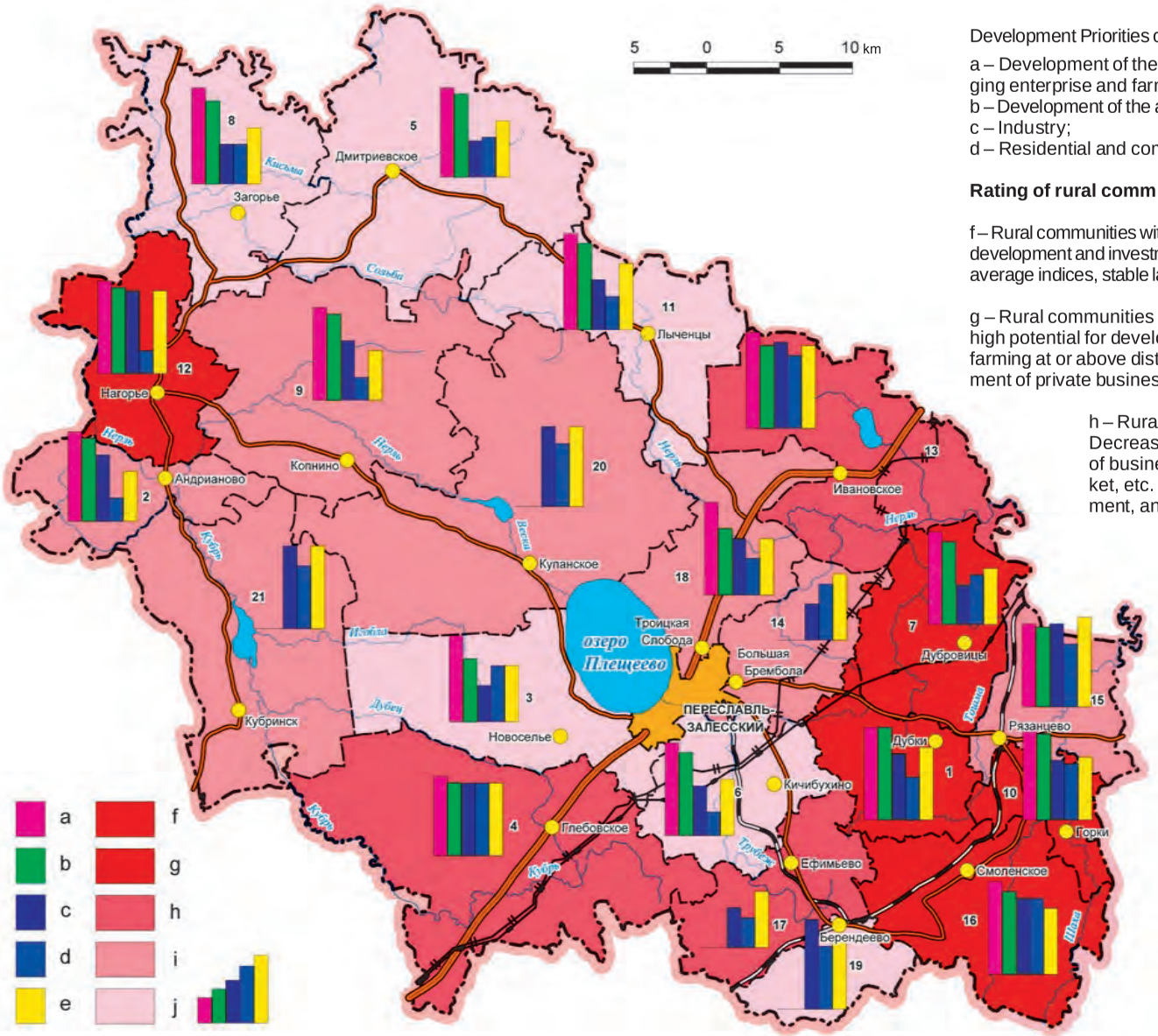
regional
municipal districts
rural entities

The numbers on the insert maps correspond to rural entities:

1 Aleksinskya	8 Zagorievskaya	15 Ryazantsevskaya
2 Andrianovskaya	9 Kopninskaya	16 Smolenskaya
3 Veskovskaya	10 Lyubimtsevskaya	17 Skoblvskaya
4 Glebovskaya	11 Lychenskaya	18 Troitskaya
5 Dmitrievskaya	12 Nagorievskaya	19 Berendeyevskaya
6 Dobrilovskaya	13 Perelesskaya	20 Kupanskaya
7 Dubrovitskaya	14 Ponomarevskaya	21 Kubrinskaya

SCALE 1:100 000

Fig. 39. Input conditions of economic and social development of the Pereslavl municipal district.



Development Priorities of (1 cm of the height of the diagram corresponds to 2 points):

a – Development of the agro-industrial complex on the basis of the integrated logging enterprise and farming;
b – Development of the agro-industrial complex in the framework of the social sector;
c – Industry;
d – Residential and communal facilities.

Rating of rural communities, by level of socio-economic development

f – Rural communities with a favourable socio-economic situation and high potential for development and investments. Increasing production, intensive farming above district-average indices, stable labour market, and active development of private business.

g – Rural communities with a relatively favourable socio-economic situation, and high potential for development and investments. Increasing production, intensive farming at or above district-average indices, stable labour market, active development of private business, no industrial enterprises.

h – Rural communities with negative socio-economic development: Decreasing production, unstable and disturbed financial standing of businesses, deterioration of fixed assets, disturbed labour market, etc. (up to 30% of indices have average potential for development, and relatively high investment risk levels).

i – Rural communities with very negative socio-economic development: Decreasing production, unstable and disturbed financial standing of businesses, deterioration of fixed assets, mechanised agriculture at or below district average, disturbed labour market (up to 50% of the indices show decrease). Low development potential and relatively high investment risk levels.

j – Rural communities with unfavourable socio-economic situations: Pronounced production decrease for all dominant economic sectors, disturbed financial standing and bankruptcy of businesses, growing wage arrears, strained labour market, etc. (more than 50% of indices show decrease). Low development potential, high investment risk .

Fig. 40. Socio-economic potential and investment attractiveness of the area.

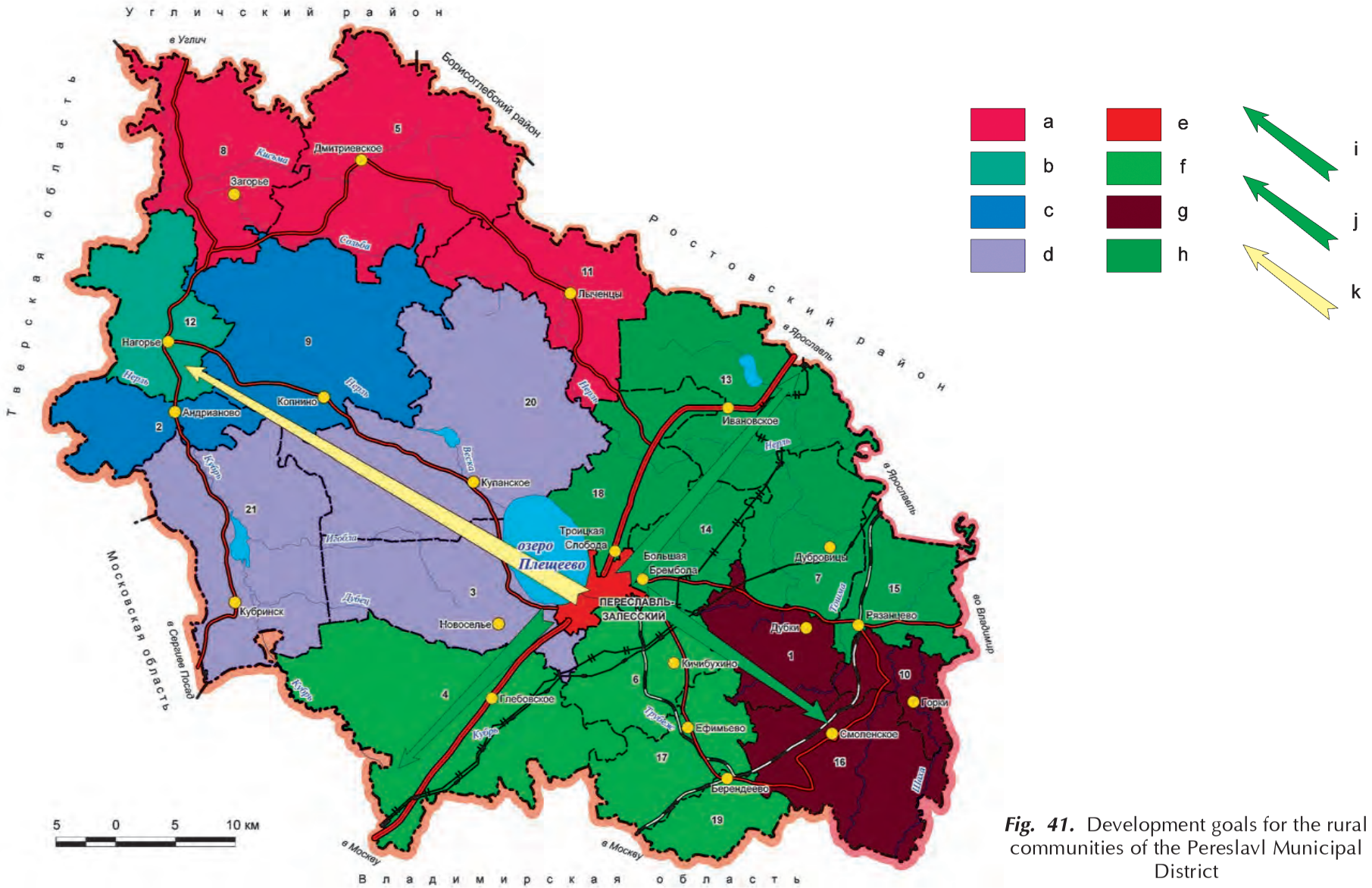


Fig. 41. Development goals for the rural communities of the Pereslavl Municipal District

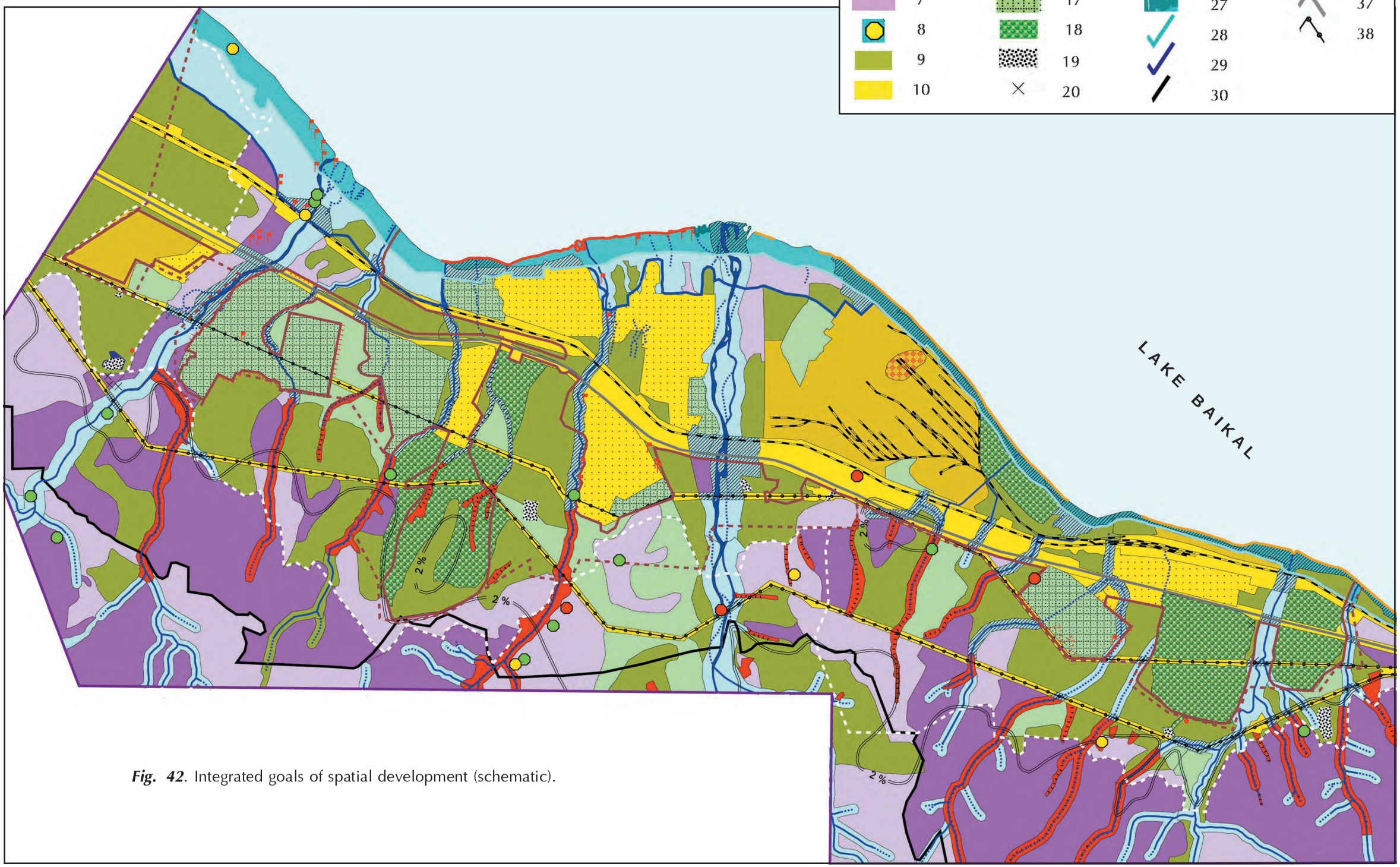


Fig. 42. Integrated goals of spatial development (schematic).

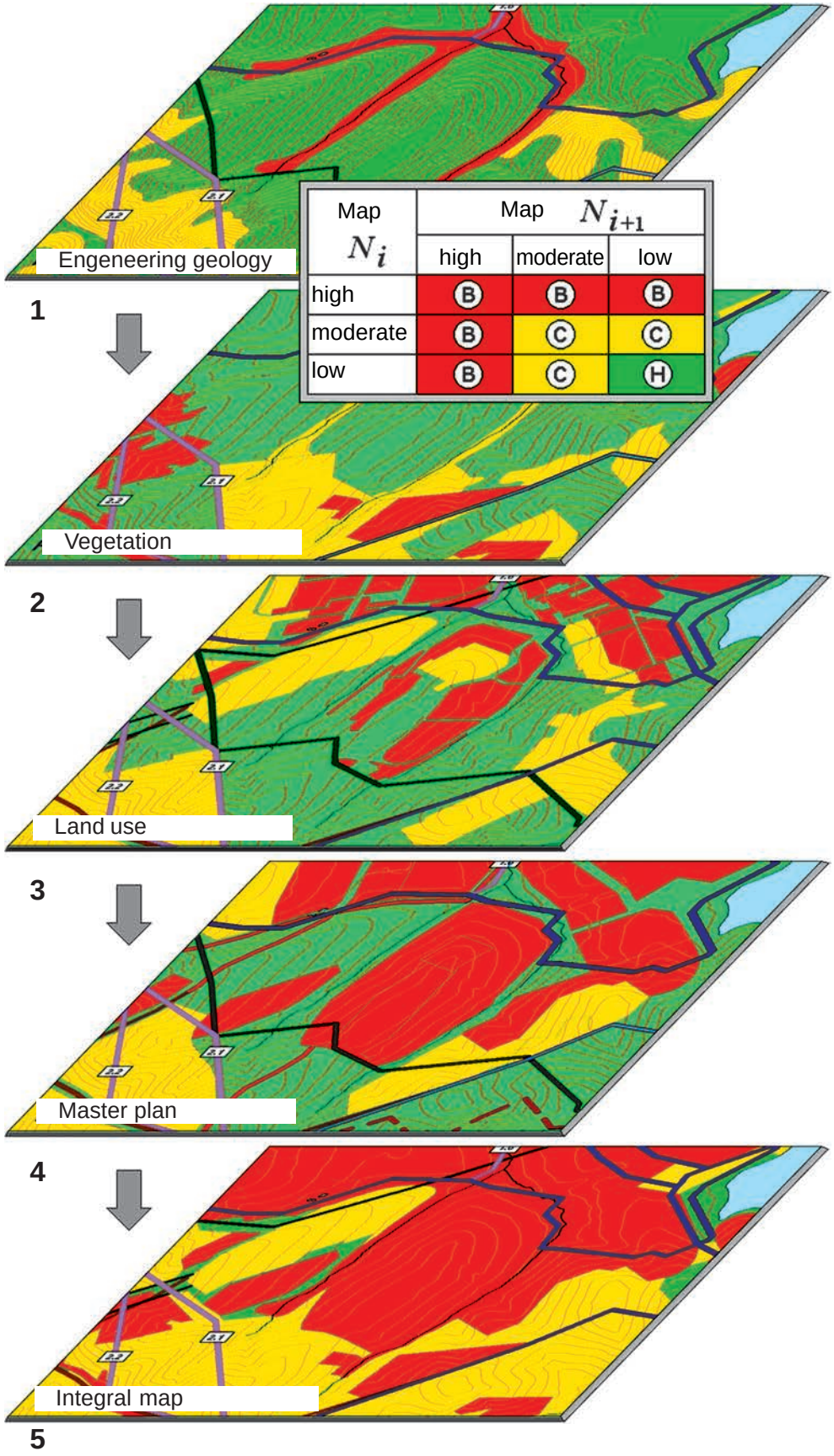


Fig. 49. Framework for integral assessment of the conflict level for the route laying.

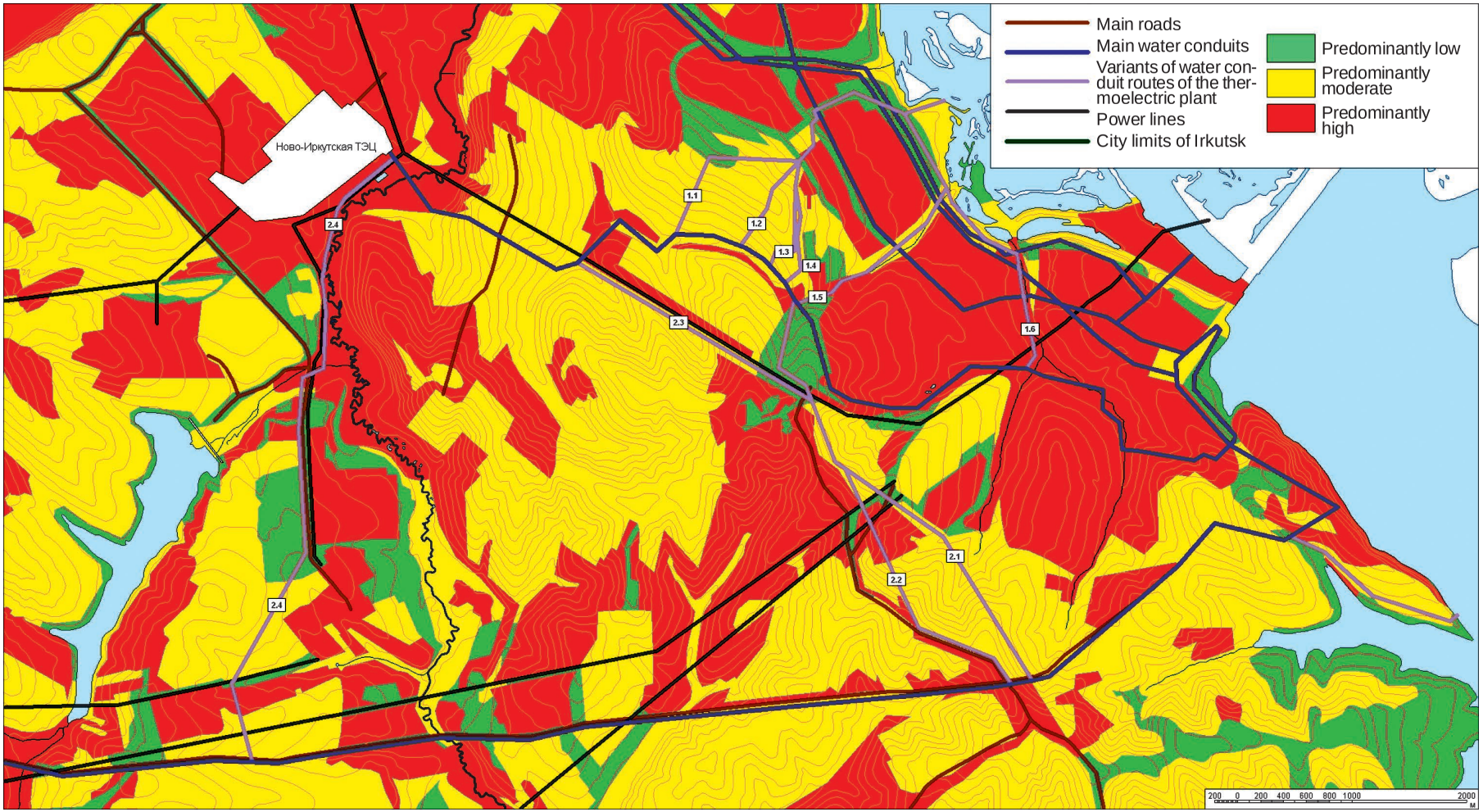


Fig. 50. The conflict level of the location of the route (integral characteristic).