CABRI-Volga Report

Deliverable D2

CABRI - Cooperation along a Big River:
Institutional coordination among stakeholders for environmental risk management in the Volga Basin

Environmental Risk Management in the Volga Basin:
Overview of present situation and challenges in Russia and the EU

Co-authors of the CABRI-Volga D2 Report

This Report is produced by Nizhny Novgorod State University of Architecture and Civil Engineering and the International Ocean Institute with the collaboration of all CABRI-Volga partners. It is edited by the project scientific coordinator (EcoPolicy). The contact details of contributors to this Report are given below:

Rupprecht Consult - Forschung & Beratung GmbH	**RC**	**Germany**	**s.rupprecht@rupprecht-consult.de**
Environmental Policy Research and Consulting	**EcoPolicy**	**Russia**	**enikitina@mtu-net.ru**
United Nations Educational, Scientific and Cultural Organisation	**UNESCO MO**	**Russia**	**m.prchalova@unesco.ru**
Nizhny Novgorod State University of Architecture and Civil Engineering	**NNSUACE**	**Russia**	**iro@nngasu.ru**
Saratov State Socio-Economic University	**SSEU**	**Russia**	**umansky@ssea.runnet.ru**
Caspian Marine Scientific and Research Center of RosHydromet	**KASPMNIZ**	**Russia**	**kaspmniz@astranet.ru**
Autonomous Non-commercial Organisation (ANO) Institute of Environmental Economics and Natural Resources Accounting "Cadaster"	**Cadaster**	**Russia**	**kad@yaroslavl.ru**
Ecological Projects Consulting Institute	**EPCI**	**Russia**	**eco-project@mtu-net.ru**
Open joint-stock company "Ammophos"	**Ammophos**	**Russia**	**syp@ammophos.ru**
United Nations University Institute for Environment and Human Security	**UNU/EHS**	**Germany**	**bogardi@es.unu.edu**
Wageningen University	**WU**	**Netherlands**	**Wim.cofino@wur.nl**
Karlsruhe University	**IWK**	**Germany**	**nestmann@iwk.uka.de**
Aristotle University of Thessaloniki	**INWEB**	**Greece**	**iganouli@civil.auth.gr**
Centro di Cultura Scientifica "A. Volta"	**Centro Volta**	**Italy**	**Franco.mercalli@centrovolta.it**
Compagnie Nationale du Rhône	**CNR**	**France**	**G.Collilieux@cnr.tm.fr**
The Regional Environmental Center for Central and Eastern Europe	**RREC**	**Hungary**	**JSimpson@rec.org**
International Ocean Institute	**IOI**	**Malta**	**ioihq@ioihq.org.mt**

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1 INTRODUCTION

CABRI-Volga D2 Report overviews present environmental situation, problems, policies and measures within water-related environmental risk management in large river basins of Europe with a major focus on the Volga Basin in the European Russia. Inquiry into existing situation and problem-solving is performed within the thematic areas covering a number of risks within sustainable development agenda for river basins and primarily related to water quality and rivers environmental rehabilitation, use of water resources, to floods and to transport mobility.

Within these thematic areas the particular accent of the D2 Report is on registry and analysis of existing problems in institutional capacity building and coordination between stakeholders towards environmental risk reduction and sustainable development in large river basins. Coordination and stakeholders partnerships are regarded among innovative tools in good water governance. Exchange of lessons learned about success and failures in water governance and in promoting coordination and cooperation in large river basins in different European countries is in the core of such assessments.

The D2 Report which is followed by CABRI-Volga Good Practices Report (D3 Report) is a part of the project phase "State-of-the-Art and Good Practices" in environmental risk management and coordination between stakeholders in large river basins. Main goals of this phase are:

- To overview the state in environmental risk management in large river basins, including evidence from relevant projects and research results
- To explore the status of coordination between institutions and other multiple stakeholders, including civil society, business, decision-makers and scientists
- To identify good and bad practices in coordination and cooperation between stakeholders in large river basins
- To explore major lessons learned from practices and case-studies within major thematic areas of CABRI-Volga

The focus of the D2 Report is on the Volga Basin – the largest river system in Europe. Similarly to many other large river basins the core question of nowadays is how to increase effectiveness of water governance which has been stalled recently. Finding innovative tools and approaches towards problem solving in reducing risks to human and environmental security in parallel to sustainable development of the basin areas is the red thread of joint actions of all stakeholders, including public, business, NGOs, government and scientific community. This is a common goal within Europe-wide context.

The D2 Report assembles evidence about current experiences and challenges not only from the Volga area, but from the EU countries as well in order to later discuss, compare and contrast approaches to common problems and to learn from each other.

The D2 Report contains a selection of essays prepared by seventeen CABRI-Volga project partners from Russia and the EU countries to illustrate on particular examples the recent domestic (Russia and some EU countries) and international experiences (the EU) in environmental risk management and coordination in large river basins. It is also based on assessments from a CABRI network of external experts from the EU and Russia.

The D2 Report starts with the Executive Summary (*chapter 2*) presenting synthesis and major findings from its analytical part (*chapter 3*). It consists of chapters assembled into three major sections:

- Volga Basin: Water for sustainable development (*chapter 3.1*)
- Institutional Frameworks in Practice: environmental risk reduction and sustainable development in river basins in the EU and Russia (*chapter 3.2*)
- Human and Environmental Security: Vulnerability assessment and flood risk reduction in the EU and in Russia (*chapter 3.3*)

The *first* chapter **Volga Basin: Water for sustainable development** is totally dedicated to the Volga River Basin. It provides a brief, but comprehensive overview of the current state of the river's environment, including surface water quality and water use, as well as of existing problems in that respect (*chapter 3.1.1*). Then it presents the main socio-economic characteristics of the Basin which define the context and potential in environmental problem-solving (*chapter 3.1.2*). Overview of the situation related to inland water transport as one of the key sectors within integrated river basin management contained in the next chapter allows initiating the CABRI discussion on pathways of sustainable development in the Volga Basin (*chapter 3.1.3*). The following chapters on the Volga Delta (*chapter 3.1.4*) and rehabilitation of the Small Rivers of the Volga Basin (*chapter 3.1.5*) indicate at importance of coordination and integration of management approaches within the entire basin area.

The *second* chapter Institutional frameworks in practice: Environmental risk reduction and sustainable development in river basins in the EU and Russia describes the present environmental institutions and trends in their development in the EU and Russia, with a particular focus on current institutional regime formation defining legal rules and administrative arrangements for collective and individual behavior of stakeholders towards a better water governance, and hence, towards a better water quality and rational water use. The overview of the EU Water Framework Directive, 2000 (*chapter 3.2.1*) is coupled with the analysis of domestic institutions and recent policies in environmental protection in Russia, including the new framework RF Water Code to enter into force next year (*chapter 3.2.2*). The chapters describing new institutional experiences in promoting local public participation in decision-making related to coastal urban land-use practices in Russia (*chapter 3.2.3*) and assessing the role of long-distance freight transport in connecting goods and people through inland waterways in the EU and Russia (*chapter 3.2.4*) indicate at recent approaches and trends within water basin management and coordination.

The *third* chapter **Human and Environmental Security: Vulnerability assessment and floods risk reduction in the EU and in Russia** deals with an overview of present approaches to enhancing human and environmental security against the risk of river floods across Europe. It contains chapters reviewing some recent general perceptions, approaches and mechanisms within integrated management of flood risks (*chapter 3.3.1*). Presentation of methodologies and tools for flood vulnerability assessments and results of their initial testing in Germany and in Russia is made (*chapter 3.3.2*). A number of lessons learned from practice about success and failures in flood mitigation during the recent catastrophic flood events in Europe in 2002 is described (*chapter 3.3.3*): some of them are important for increasing effectiveness of river flood management in Russia. It finalizes with analysis of institutional designs for natural disaster risk reduction and current problems in implementation of flood risk reduction policies and measures in Russia in general, and in the Volga Basin, in particular (*chapter 3.3.4*).

The knowledge assembled in this Report is a small, but crucial stepping stone in assessment of present situation and challenges in environmental risk management in large river basins with a special focus on institutional coordination and partnerships between multiple stakeholders. Such evidence serves as a basis for getting answers

within the next phases of CABRI-Volga to a number of important questions which are on the agenda both for the EU and Russia:

- What can be done to solve existing coordination problems in large river basins?
- What innovations are needed to reinforce (a) institutional capacity for coordination in river basins at government level (vertical and horizontal), and (b) government policy frameworks to promote partnerships between stakeholders?
- How to strengthen a dialogue between multiple stakeholders, their partnerships and involvement in water-related environmental risk reduction in large rivers?
- How to involve local public in decision-making and environmental actions?
- How to enhance cooperation and mutual transfer of good practices and knowledge in sustainable development of large river basins between the EU and Russia?

Development of CABRI-Volga recommendations and suggestions for future actions are heavily rooted into this Report.

CABRI-Volga aims at playing a catalytic role: to promote formulation of new approaches, ideas and putting them into action. This Report is an input of the CABRI-Volga towards developing an open dialogue between experts representing multidisciplinary knowledge and practice. It also contributes to developing domestic and international partnerships between multiple stakeholders in large river basins, including representatives of civil society and local public, government authorities, municipalities, businesses, water services providers, and scientific community. Expanding networks of expertise worldwide and learning from each other is essential for effective coordination in large river basins. This Report is an initial step towards this goal.

We are grateful for contributions of the project partners and experts from Russia and the EU countries who provided their assessments of the situation, related problems and identified possible options for problem-solving. Results of discussion at the CABRI-Volga 1st Expert Group Meeting in Nizhny Novgorod, Russia (September, 2005) are used in this Report. The D2 Report is prepared jointly by the CABRI-Volga partners: the Nizhny Novgorod State University of Architecture and Civil Engineering (NNSUACE), Russia and the International Ocean Institute, Malta. Report editing and its Executive Summary is done by EPRC, Russia. We acknowledge valuable advice and reviews of Prof. Bela Petry, the member of the CABRI-Volga Policy Advisory Board.

EcoPolicy, Russia

2 EXECUTIVE SUMMARY

The Executive Summary of the CABRI-Volga D2 Report "Environmental Risk Management in the Volga Basin: Overview of present situation and challenges in Russia and the EU" presents the synthesis and major findings from analytical part of the document.

CABRI-Volga D2 Report overviews present environmental situation, problems, policies and measures within water-related environmental risk management in large river basins of Europe with a major focus on the Volga Basin in the European Russia. Inquiry into existing situation and problem-solving is performed within the thematic areas covering a number of risks within sustainable development agenda for river basins and primarily related to water quality and rivers environmental rehabilitation, use of water resources, to floods and to transport mobility. Within these thematic areas the particular accent of the D2 Report is on registry and analysis of existing problems in institutional capacity building and coordination between stakeholders towards environmental risk reduction and sustainable development in large river basins. Coordination and stakeholders partnerships are regarded among innovative tools in good water governance.

The D2 Executive Summary follows the structure of the D2 Report and it consists of three sections:

I. Volga Basin: Water for sustainable development
II. Institutional Frameworks in Practice: environmental risk reduction and sustainable development in river basins in the EU and Russia
III. Human and Environmental Security: Vulnerability assessment and flood risk reduction in the EU and in Russia.

I. Volga Basin: Water for Sustainable Development

1. Coordination between environmental, social and economic considerations is crucial...

Sustainable development of large river basins and integrated river basin management are closely interlinked. Within these both concepts there is a growing understanding that integration of *environmental-economic-social* considerations within river basins development is of utmost importance. Management of natural resources and ecosystems in large river basins is to be built on multidisciplinary approach and on good coordination, cooperation and partnerships between major stakeholders in a river basin, on perfect transparency and their access to information, as well as on local public participation and initiative. Although significant advances had been registered during the last decade in incorporating mechanisms for institutional coordination and multiple stakeholders partnerships into integrated river basin management in the Volga, similarly to other large river basins in the EU the coordination problem still has not been solved.

2. The Volga Basin is the largest river system in Europe...

Linking *scientific knowledge* about environmental situation regarding water quality and water use, about socio-economic developments and societal vulnerabilities/risks in the Volga Basin with *decision-making* process is the basic condition for outlining possible options for water-related environmental risk reduction and problem-solving through application of coordination mechanisms and tools. The D2 Report starts with the general overview of the water-related environmental situation, of the socio-economic characteristics in the Volga Basin – the largest river system in Europe (1 358 million sq. km) flowing for 3 530 km to the Caspian Sea and forming the huge delta area with its wetlands considered to be the best conserved in Europe. Thirty nine federation subjects of the Russian Federation - entirely or partly located in the basin contribute to nearly a

half of the national industrial and agricultural output. Through its water-ways and canals system the Volga Route connects five seas of Europe and regions as far as Scandinavia and Asia, and during the 14-16th centuries it used to be a part of the famous Hanzey Route. There are a number of areas in the Volga Basin where the environment is in a crisis situation. But in overall the environment, including water quality is better than in the Western Europe. For example, recent monitoring results indicate that according to chemical and biological parameters, the water quality in the Volga is not ideal, but it is better than in the Rhine and the Elbe.

3. Drinking water quality is at the top of the Volga Basin agenda...

For the Volga Basin the water quality, especially of *drinking water*, is at the top of the environmental agenda. The major reasons for water quality problems are the lack of technical facilities, inefficient purification and disinfection systems. Currently, deficiencies in municipal infrastructure for drinking water supply systems, sewerage, urban waste water management and water losses in water distribution networks[1] are the key problems which diminish the quality of life in the Volga regions. As a result only 15 percent of treated waste waters meet national standards. None of the major cities in the Volga Basin are supplied with the drinking water of a quality meeting the national standards and WHO regulations. At the same time ecological standards in the Volga Basin are stricter than international ones, and sometimes it even makes them difficult or unrealistic for the water-users to comply with. Among other water related environmental problems in the Volga Basin is inefficient water use: the level of water per capita consumption in the basin is about 1.2-1.7 times higher than in the West. The major reason is inadequate economic incentive mechanisms to provide for efficient water consumption and water savings both by households and businesses.

4. The Volga Delta is the unique site for biodiversity conservation...

Among other current problems in environmental governance in the Volga Basin is protection and biodiversity conservation in the Volga Delta and the Lower Volga that are considered of a global importance: part of the Volga Delta is included into Astrakhan Biosphere Reserve, about a half of its estuary is the Ramsar Site, while the Lower Volga provides spawning grounds for sturgeon. As a result of unsustainable human pressures in the Delta the following problems are registered: decline in commercial fish stocks, deterioration of environmental quality due to upstream pollution, degradation of coastal landscapes and loss of coastal habitats. Similarly to other Volga regions the stakeholders cooperation/coordination in environmental field is quite weak. Among serous concerns related to environmental problem solving in the Lower Volga and Delta is poor public participation. Recent surveys indicate that although a large part of population (80%) is preoccupied with ecological situation, only 16% agree to directly participate in environmental actions. Approaches on heavy reliance on the state and its ‘paternalism” are characteristic; most respondents link environmental amelioration mainly with strengthening governmental control and tightening ecological legislation, while only less than a quarter believe that increase of local public awareness and communities involvement in local action can be regarded as effective means for environmental problem solving. Recent interesting examples of increase in business involvement for these purposes are provided by the large LUKOIL energy company. It has established corporate programme of marine environmental monitoring at its development sites in the Northern Caspian and has regular data exchange with responsible government bodies; it supports efforts towards increase of public ecological awareness and education in Astrakhan oblast, it orginises regular public hearings on

[1] Water losses in distribution networks in the regions of the Volga Basin account annually for about 25% of the drinking water consumption.

ecological impacts of marine oil and gas developments, and it is involved in sturgeon reproduction in the Delta.

5. Rehabilitation of Small Rivers is integral part of basin management...

About 2600 small rivers feed the Volga River. Their rehabilitation, protection and development is among key pressing issues on environmental agenda because under impact of significant and unwise human pressures many of them have degraded, or even disappeared. At the same time they are of a particular importance for the Volga Basin sustainable development, for the local livelihoods as about ninety percent of rural population resides in their riversides and everyday life is inspired by a small river welfare. Along with industrial impacts small rivers are facing pressures originating from agriculture, non-point sources of pollution and household wastes disposal. There is an urgent need to coordinate efforts of various stakeholders in small rivers rehabilitation; unfortunately, stakeholder's cooperation and local partnerships are very weak. At the same time potential for local public involvement and application of rich local knowledge in decision-making, for local participation in concrete actions for rehabilitation of riversides where they live is enormous. Awareness arising is in the core of rehabilitation approach, while mobilization of local capacities can be enhanced through the" State fund for small rivers conservation".

6. During the nineties the decline in water pollution was attributed to national economic crisis, while today in parallel to economic growth some pollution reduction is registered...

According to official data the polluted waste water discharges in the Volga Basin were reduced by about 29 percent during the second half of the nineties. The major reason has been in decline of industrial production during the economic crisis in the 1990s, while comparatively modest share in polluted water discharges reduction has been attributed to installation of new purification facilities and technological innovations. Potential of the latter towards polluted water discharges reduction in the Volga Basin is enormous. The discharges might increase with the current economic growth. However, the growing economy is expected to finance the environmental clean-up. Recently, there are first promising signs that in some Volga regions together with the economic growth the level of water pollution is declining.

7. Specifics in social and economic development define the context for environmental management options in the Volga...

Environmental management in river basins, in general, and in the Volga Basin, in particular, needs to be coordinated within broader socio-economic regional and national context, including sustainable development issues. Existing 'situational' economic, social and political factors significantly affect river basin management turning it into complex multidisciplinary problem. General socio-economic situation in the Volga Basin defines the specifics and trends in environmental risk reduction and challenges for institutional coordination and cooperation between main stakeholders in environmental problem solving. Thus, the main features in development of institutional coordination and stakeholder participation in environmental protection are rooted to a high extent in current regional peculiarities and situational factors of economic and social development in the basin.

8. Level of depopulation and poverty in the Volga Basin is alarmingly high...

Usually, the general destabilization of environment is directly linked to deterioration of human health, social problems and demographic profile. Among current social and demographic risks, and hence societal vulnerabilities in the Volga Basin which are

common to many other Russian regions is that significant part of population lives in poverty – about 43% of population in the Volga Basin has income lower than subsistence level and about one third of its population is unemployed or is in informal sector of economy. Perhaps among the most alarming symptoms of human insecurity is depopulation, which has been increasing since the early 1990s. Currently, the mortality rates in the Volga Basin are higher than the birth rates, while life expectancy (66 years) has also declined during the last decade[2]. The level of urbanization in the Volga Basin is quite high: about 74% of its total population[3] lives in 445 cities[4], or urbanized areas. Among priority current issues is the revival of small towns[5] of the basin with their valuable traditional occupations, history, culture and knowledge of the local public; they are expected to serve as the centers of tourism and recreation.

9. Industrial and agricultural potential of the Volga Basin accounts for almost a half of national total...

The Volga Basin accounting only for 8% of Russia's territory contributes for nearly 45% of total domestic industrial output, and for 50% of agricultural production. Gross regional product per capita in Moscow city, in Tatarstan republic, Perm, Samara, Vologda oblasts exceeds the national average, while the most actively developing regions of the Volga Basin during the last decade has been Moscow city and Tatarstan Republic. Export growth rates are the highest in Moscow agglomeration, Samara and Vologda oblasts. Investment and innovation opportunities in these regions of the Volga Basin are also expanding. As a result they are at the national top of the federation subjects that are responsible for the recent high economic growth rates in Russia[6]. Natural resources (oil, gas, forestry) and electricity production, industries (auto-, ships, aircraft manufacturing, ferrous and chemicals) along with agriculture of the Volga Basin contribute to its high regional economic potential. Rapidly growing modern corporations, especially in the energy sector are among the major drivers towards innovations and sustainable development of the basin. Such features define an increasing diversity of actor groups and their multiple interests within sustainable development agenda and they appear to be important stakeholders in environmental risk reduction; their role in establishing new participatory patterns in the field is expected to grow rapidly.

10. The Volga is navigable for about half a year; it is navigable for 2.6 thousand km and has the world biggest flatland hydropower cascade...

Existing transport infrastructure in the Volga Basin and related problems in its development define the specifics in regional transport mobility and potential for using inland water-ways in connecting goods and people. The Volga is a part of diversified European water-way system which connects Volga-Don-Neva and their basins, as well as five seas in the north, south and in the west of the European Russia. The cascade of artificial reservoirs and 11 hydropower stations on the Volga and its major tribute the Kama is the biggest flatland hydropower cascade in the world and this system provides regulation of water level during the navigation period. The Volga is navigable for about 2,600 km. North-South water ways in the basin are intersecting with the West-East road infrastructure.

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[2] At the beginning of the 21st century Russia ranked first among developed countries on the mortality index and it ranked 51st in the world for average life expectancy.

[3] Total population in the Volga Basin accounts for about 57 million.

[4] Seven cities in the Volga Basin has population over 1 million – Moscow, N.Novgorod, Samara, Perm, Kazan, Ufa, Volgograd.

[5] Population below 50 thousand people

[6] In 2005, according to official data the GDP growth rates in Russia accounted for 6.4%.

11. The European dimension of the Volga Basin is strengthening in the context of the Pan-European transport corridor...

The importance of Pan-European dimension in the Volga Basin is growing, especially in the context of further development of the so-called Pan-European corridor connecting Berlin-Warsaw-Minsk-Moscow-N.Novgorod. Transport water corridor Volga-Don-Danube which would connect the large inland waterways of the Rhine, the Main, the Danube, the Dneper, the Don and the Volga is currently promoted. East-West oil and gas pipeline systems intersect the Volga Basin; today the major freight shipments in the basin are carried by railroads which go along and across the river. Among existing problems is that during the 1990s the role of water based transport (expressed in volume of freight and passenger convey) had been reduced; also, inland water transport in the Volga Basin is poorly integrated into transport system of Russia and Europe. Among pressing problems is how to revive it and to integrate into the transport system considering the strategic dimension of long-distance transport for growing economies and competitiveness of the Volga regions.

II. Institutional Frameworks in Practice: Environmental Risk Reduction and Sustainable Development in River Basins in the EU and Russia

12. Framework institutional designs establish basic context for implementation actions of all stakeholders in the river basins...

Existing national and regional institutional frameworks for environmental risk reduction, including a system of legislation, administration, tools and instruments for the use of the environment and its resources, funding mechanisms, programmes and strategies set rules guiding individual and collective practices and behavior as well as governing human interactions and serving as a basis for coordination/cooperation between multiple stakeholders. In practice, quite often significant deviations occur between design and action of institutions, and their usually progressive goals in a course of implementation do not always result in declared outcomes. That is why in this section the D2 Report overviews the institutional designs in environmental risk reduction in Europe and in Russia and indicates at a number of problems related to implementation and effectiveness of existing international and domestic institutions. It also highlights some aspects of coordination problems in water-related environmental problem solving. It starts with the brief description of the EU Water Framework Directive (WFD) which sets the basic institutional context for protection and conservation of water resources in Europe. It is particularly important in the context of recent adoption of the new RF Water Code (to enter into force 1 January 2007) which established many similar principles of a framework design for water governance. Then it turns to assessing major challenges and problems of environmental reform in Russia during its transition in the 1990s to a market economy and democratic society. It overviews options of how to enhance local public participation in environmental decision-making on examples of new practices of public hearings related to land-use in the cities in the Volga Basin. Main trends and problems related to transport mobility in inland waters are presented as an element in the strategies of integrated river basin management and its sustainable development.

13. The EU Water Framework Directive aims at tight coordination and integration of a variety of water-related policies and measures in the countries of Europe...

Today, development of coordinated water policy is among the EU top priorities in the context of its sustainable development in the European countries, and institutional regime formation in this field has been rapidly progressing during a couple of the last decades. It culminated in adopting in 2000 the EU WFD which along with other issues

lays basic principles for integrated water basin management and for coordination between stakeholders along the European rivers. It sets context for tight coordination and integration of a variety of policies and measures, and it also presumes territorial, sectoral and thematic coordination of actions and tools applied. Its key elements in that respect include: a) adoption of a common and single approach to water management based on river basins (within it, usual administrative boundaries are no longer applied); b) integration of all water sources (i.e. rivers, lakes, coastal and ground waters) management into comprehensive schemes for each river basin; c) setting unified regime for integrated management of surface and ground waters at the European level and coordination of objectives; d) requirement for cross-border cooperation between all countries and administrative units and districts within individual river basin; e) promoting active participation of all stakeholders, including NGOs and local communities in water management activities, and, in particular, in the Directive implementation and in compiling, review and updating the river basin management plans. These approaches to coordination/cooperation issues were supported by the CABRI-Volga experts' assessments indicating at necessity of application a "one river - one governing body – one plan/programme" notion in order to attain effective coordination of interests and actions of stakeholders for the sake of the river and its basin.

14. The RF Water Code is to enter into force in 2007 and the environmental institutional reform of the nineties has been a success of the new Russia...

During the nineties, significant reorganization of the Russian domestic and international environmental policies took place. Introduction of new legislation, administrative reorganization, decentralization of environmental management, introduction of economic instruments and tools, wider participatory patterns, including new role of business and NGOs, environmental impact assessment, ecological *glastnost*, support for international global environmental change agenda (Russia is a party to about a hundred international environmental accords) are among key elements of environmental reforms. Formation of new institutional capacities for environmental risk reduction can be regarded as a success of the new Russia. These institutional innovations set up the basis and open new challenges for coordination and partnerships between stakeholders which are still insufficiently developed within environmental problem solving. However, together with broader opportunities for institutional modernization in environmental sector, the specifics of changes in economic, social and political systems during transition in the nineties imposed constraints on application of some new tools in environmental management, including those copied from the West. Their effectiveness appeared to be lower than predicted at the start of reforms. Challenges are associated with the recent administrative reform in Russia and with advances in a market economy which are expected to mobilize new human, technological, institutional and financial potentials for environmental risk reduction. General environmental institutional framework in the country, success and failures in its implementation defines to a high extent the context for environmental risk management in the Volga Basin, and particularly, main features in coordination between various stakeholder groups. The RF Water Code which is to enter into force in 2007 establishes an institutional framework for water governance in large river basins.

15. Coordination between stakeholders in large river basins is still insufficient both in the EU and in Russia...

Similarly to many other countries, despite efforts to apply basin management approaches in such large river basin as the Volga, these approaches are not sufficiently used and many coordination problems are to be solved. These problems indicate that 1) integrated river basin management needs to be coordinated within broader socio-economic sustainability development schemes; 2) multilayered institutional problems and overlap of competences and responsibilities between institutions of various levels

result in poor performance and insufficient coordination; 3) exaggerated emphasis on the lack of financial resources is obvious, while the core of the problem is in identifying tools for their mobilization in the basin and coordination of allocation mechanisms; 4) the Volga Basin indicates at comparatively lower than in the EU local public participation and initiative in environmental decision-making, at poor use of rich traditional knowledge that does not allow to benefit from rich potential of the Volga communities; 5) insufficient coordination between stakeholders and their interests is a bottleneck in the problem-solving. Identifying tools and instruments for promoting coordination and cooperation is among top items of the agenda for the basin. At the same time, although the Volga Revival Programme has been recently closed (2004) it has been a unique experience in basin-wide coordination and some of its participatory approaches had been successfully tested in practice. The role of cooperation between the Volga regions with their counterparts in the European Union and building twinning partnerships is of a growing importance and its is joint cooperative projects and initiatives are to be a backbone for the common environmental space formation.

16. A variety of practical efforts are undertaken in Russia to deal with existing problems of poor public participation in environmental decision-making...

Among existing loopholes in environmental management in Russia in general is weak public participation in decision-making and in environmental actions. To a high extent it is a “heritage” of the Soviet political system, and in a course of democratisation in Russia various efforts are undertaken to promote public participation. The below case describing possible ways to opening wider access for local public to decision-making within coastal urban land-use practices is an interesting example of new approaches to the issue. Assessment of opportunities for public participation in decision making through public hearings suggests it to be a promising tool for a wider use in domestic practice in Russia. Practical evidence about development of innovative procedures supporting a civil society dialogue related to land-use practice in the coastal urban areas in the Volga Basin is growing, and it is based on the recent regimes established by the new RF Land Code, 2001 and RF City Planning Code, 2004. Among means suggested for solving possible conflicts between various interest groups and for broader public involvement is enhancing support of constructive and positive public initiatives. It might help to reconfigure current patterns of public participation and shift initiatives from protest public actions against some construction initiatives and land-use practices to a positive and constructive involvement in problem-solving on a permanent basis. Legal zoning is also suggested as an instrument for solving the land-use conflicts in urban areas of the basin.

17. Application of transport intermodality approaches are especially important within the river basin...

Transport infrastructure is among the key elements to be integrated into sustainable development schemes for the river basins. As all of the five CABRI-Volga thematic areas are very complex, including the issues of transport mobility in connecting goods and people, the D2 Report suggests to concentrate on problems and challenges of long-distance freight transport (and traffic) on inland waterways. Inland waterway transport is considered ecologically safe and reliable; however it is not sufficiently flexible and quick in deliveries and is not competitive enough to road and railway transport. It is recognized that different transport modes are to work together based on *intermodality* which needs to be fostered as a standard transport principle; particularly important is application of such approaches in the river basin context. While in the EU countries the inland waterway transport in term of freight volume has seen slight increase over the last fifteen years, in Russia, less than 4 percent (i.e. similar to the whole EU) of the total transport volume is carried by inland waterways and its sharp

decline has been registered during the same period. In Europe, in the beginning of the 2000s efforts are undertaken to promote development of inland water transport and to unify the rules governing this sector; internalization and multimodality call for more coordination and cooperation between stakeholders involved along the transport chain at the Pan-European level.

III. Human and Environmental Security: Flood Risk Reduction in the EU and Russia

18. Flood risks reduction and enhancing human security against disastrous floods is rapidly entering the environmental agenda...

The topic of human and environment security and vulnerability in large river basins focuses on reducing risks to people and environment from such hydrological extremes as floods and droughts. This section of the Report starts with an overview of general approaches to flood disasters risk reduction. Then it outlines approaches to vulnerability assessments applied recently in Europe and in Russia. It briefly characterizes some lessons learned from the catastrophic floods in Europe in 2002 and turns to an overview of institutional framework for natural disaster risk reduction in effect currently in Russia

19. Floods are natural disasters that are natural by their origins, but also they represent socially constructed risks...

Floods are essentially natural hazards that occur regularly, but become disasters when they interact with the human society. In most cases natural factors are the main causes of floods; however, anthropogenic factors such as human occupation of flood plains, extensive urbanization, basin-wide land-use changes and structural measures to mitigate floods had modified natural characteristics of extreme floods. Recent catastrophic floods in Europe and Russia show that human actions and traditional river engineering may increase in the frequency of small and medium floods and negative human and economic damage. Also, reliance within flood defense only on structural measures proved to be ineffective; it interferes with natural river flow, it offers protection only against minor or medium events, it creates a false notion of security among people living in flood prone areas (defenses might be ineffective in case of extreme events) and local communities, thus, are not willing to adopt all necessary spectrum of preventive measures which increases their vulnerabilities.

20. Flood risk management is an essential element of integrated water management in the river basins...

Integrated flood risk management is a part of integrated water management in the river basins; it is defined as a multi-dimensional and multi-disciplinary activity, which takes into account a combination of technical, institutional, economic, social and environmental aspects of flood risk reduction. It includes all stages of flood control including risk assessment, prevention and mitigation, emergency and rehabilitation. According to such notion the river basin is considered as a whole with downstream/upstream solidarity and coordination between all actors in the river basin (water agencies, municipalities, inhabitants, companies). Among existing loopholes in the scheme is, for example, the need to take into account that within river basins the major cities are often better protected than small livelihoods and rural communities, and the level of human vulnerabilities there is higher.

21. Vulnerability assessment to the risk of floods is particularly important at the local scale...

Vulnerability assessment of individuals or communities towards floods is an important component of disaster risk analysis. Any disaster risk reduction needs to take into account the results of vulnerability analysis which is able to pinpoint the areas of intervention to reduce risks. Vulnerability assessment serves several purposes: 1) allows to identify vulnerable elements within community and to determine policies to alleviate them; 2) contributes to determining more effective protection, planning, resource allocation to reduce risks. However, vulnerability assessment is not a simple task as vulnerability is often defined differently depending on background and interests of scientists and practitioners. Risk toward any hazard can be determined by the probability of a hazard to become an actual event and by the vulnerability of exposed communities. Several risk indicators had been developed for flood hazards, one of the best known is the Disaster Risk Index (DRI). It operates at the national scales, and it is the ratio of casualties due to floods over a number of individuals exposed to floods in a given year, and was calibrated with data 1980-2000. Unfortunately, it does not provide practical information for decision-makers who need to act to reduce flood risk and vulnerability in a particular region of a country, but not only at a national scale. That is why UNU/EHS carries out vulnerability analysis at a local scale.

22. Most lessons learned from 2002 catastrophic floods in Europe are important for the Volga Basin...

Between 1998-2002, Europe suffered about 100 damaging floods affecting 1.5 percent of population, causing 700 fatalities, half million of displaced people and Euro 25 billion in insured economic losses. Extreme flood events in the Central Europe in August 2002 caused heavy damages and losses of human lives, and total flood losses estimated at about Euro 15-16 billion. Some lessons from this flood indicate that still many uncertainties remain on whether climate change could intensify the peak of floods in the Central Europe. Direct human interventions in river basins are manifold, including chanellization and hence increased river velocity, modifications in river courses, losses of flood plains and retention capacity, increase of impervious surface of landscape, changes in land-use patterns and intensive urbanization. Trends towards shorter flow time is obvious and very probably intensity of smaller and medium floods increased; in general there is no evidence that extreme floods are modified as they overtop dykes and inundate their old flood planes as it happened during the 2002 flood. Along with other issues the need for modification in institutional responses includes: 1) need for reliable forecasts; 2) effective early warning system; 3) coordination between regional, provincial and local authorities for land development plans, especially in residential areas; 4) further development and revising of compensation mechanisms for affected livelihoods. Most of lessons learned during the 2002 catastrophic flood in Europe are relevant to Russia and its Volga Basin, and, in particular, to flood control on small rivers of the basin.

23. Although the Volga River is highly regulated by the cascade of dams, the Basin is regarded as a flood prone area...

Flood risk reduction is ranking high within the national natural disaster reduction agenda in Russia: about 400 thousand sq. km is flood prone areas. Flood mitigation is an integral component of national institutional framework for natural disasters risk reduction which is quite well established in the country. Institutional design and performance of the latter over the last decade has been producing more advanced results than in environmental protection which has been under constant reorganization. Within flood risk reduction strategies an emergency mitigation component is clearly

institutionalized, while flood prevention and mitigation has poorer institutional capacities. It clearly illustrates the currently prevailing world practice when more efforts and resources are directed, so far, to emergency response to floods, rather than to capacity-building to mitigate them. Currently, new coordination mechanisms and integration is being developed between the Federal Agency for Water Resources (under the RF Ministry for Natural Resources) and the RF Ministry for Emergencies and their territorial branches; many of them are targeting flood mitigation within a broader context of sustainable development of river basins. Although the Volga River is highly regulated by the cascade of dams and artificial reservoirs the basin is regarded as a flood prone area, and floods are among regularly occurring natural disasters within the basin. All small rivers in the basin and livelihoods located there are regularly flooded. According to existing estimates about 4.7 million of people living in the basin are potentially vulnerable to floods. In 2004, the damage from floods in the Volga Basin accounted for 958 million rubles, or 45% of the national total that year. The Volga-Kama cascade can be regarded as interesting lesson in application for about several decades of flood mitigation instruments, and assessment of pro- and cons- of such structural measures within sustainable development of river basins is extremely valuable in the Pan-European context. Human toll from construction of the Volga artificial reservoirs had been significant as it resulted in serious social tensions due to population resettlement from the livelihoods flooded by artificial seas.

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3 OVERVIEW OF PRESENT SITUATION AND CHALLENGES

3.1 Volga Basin: Water for Sustainable Development

3.1.1 Water Use and Surface Water Quality in the Volga Basin

Nizhny Novgorod State University of Architecture and Civil Engineering, Russia

Introduction

The Volga River is the largest river system in Europe. It flows for 3 530 km to the Caspian Sea forming the delta with the area of 11 thou. sq. km which wetlands are considered the best conserved in Europe. There are about 151 thousand rivers and small streams in the basin including more than 200 sizable tributaries of which many are navigable.

The Volga Basin area covers 1.358 million km^2. It is shared at least partly by 39 most densely populated and industrialized regions of the Russian Federation. The Volga Basin occupying only 8 % of the country's territory accounts for nearly 45 % of its industrial potential, 50 % of agricultural production facilities and about 57 million of its population. There are 444 towns located in the Volga basin area and 57 million people of various nationalities live there. The basin's average population density is 42 inhabitants per square km. About 80 percent of the population in the basin lives in urban areas *(V. Naidenko. 2003; The Volga Vision)*. 39 federation subjects (oblasts, republics, autonomous okruigs, krays) totally or partially are located at the Volga basin. Their population exceeds 55 million.

Water availability

The Volga is fed for about 73% by melting snow water, and it is prone to high and long spring floods. During the spring floods discharge of the rivers in the basin amount to 50-90% of annual discharge while the winter discharges comprises only 4-15%. Seasonal water flow modulation gives rise to floods, droughts and seasonal changes in navigation.

Annual average precipitation ranges from 600 to 800 mm in the northern part of the basin to 500-600 mm in the middle part and to 180-200 mm in the delta area. Accordingly, the average runoff module varies from 10 litres/km² in the Upper Volga to less than 0.2 liters/km² in the Lower Volga. The mean annual discharge of water at the mouth of the Volga is 254 km³.

Stable water supply in the basin is provided by a large number of reservoirs including the Volga-Kama cascade of 11 reservoirs (total storage capacity at design level is 187 km³) regulating the Volga flow and ints inflow into the Caspian Sea. (V. Naidenko. 2003).

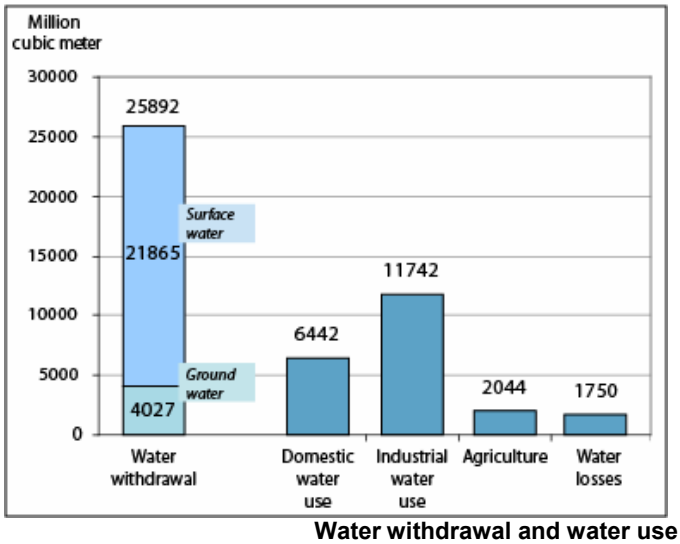
Renewable groundwater resources in the Volga basin are estimated at about 40.05 km^3/year, approved groundwater exploitation is 7.86 km^3/year. At present, the total groundwater withdrawal in the Volga basin amounts to 4.03 km^3/year *(Protection of the Environment)*.

Figure 1.: Water use

Water use differs across districts and economic sectors. Table below indicates at clear variations in water use by sectors along the Volga River.

Water use by sectors along the Volga River in 2000, % *(The Volga Vision)*

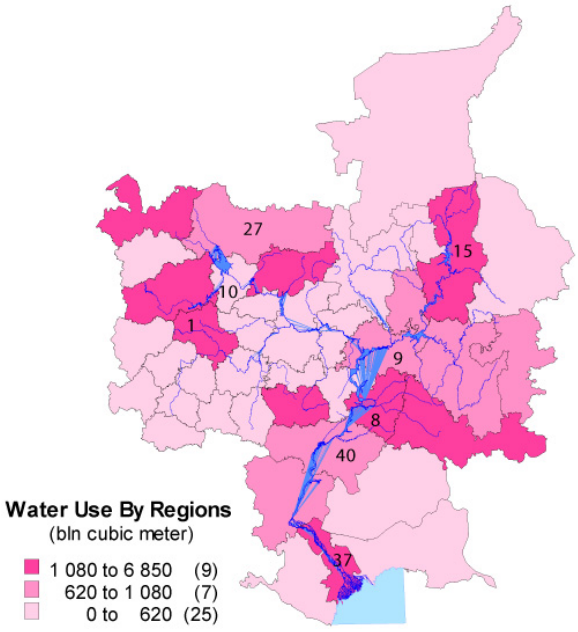
	Industrial water use	Domestic water use	Agriculture	Total
Upper Volga	15,88	2,67	0,26	18,80
Middle Volga	36,41	21,50	2,39	60,30
Lower Volga	10,15	2,74	8,01	20,90
Total	62,44	26,90	10,66	100



Water withdrawal and water use in the Volga Basin in 2000
(Protection of the Environment)

Figure 2.: Differences in water consumption in the Volga Basin are characterized by:

1. Territorial spread of water consumption indicates marks areas of greatest load on the Volga River. Intensive water use makes regions more vulnerable to chemical and biological pollution. Vulnerabilities are associated with both water quality and water quantity.
2. Water consumption per capita in the Volga Basin is significantly higher than in Europe.
3. Water consumption in Moscow and S. Petersburg agglomerations are extremely high due to high population.
4. Regions located on the Kama, the Mid- and the Lower Volga are also characterized by high water consumption.
5. Risk reduction based on water use reduction is important for following regions.
   - Moscow and Moscow oblast
   - Tver
   - Kostroma
   - Perm
   - Penza
   - Samara
   - Orenburg
   - Astrakhan



Public water supply and municipal wastewater treatment

Public water supply comprises about 25% of total water withdrawal from all sources in the Volga Basin *(Protection of the Environment)*. Approximately 85 % of water used for drinking water supply is taken from surface water sources, although rural areas rely mostly on groundwater.

In 2000, municipal waterworks purified 64.3 percent of total water withdrawal, with 18 percent purified in the rural areas. In 1995 these figures were 56.6 percent and 14 percent respectively. In 2000 the daily average drinking water supply in rural areas was 296.2 liter per person compared to 146 liter per person on average in the basin.

At present there is a tendency towards reduction of drinking water consumption in the cities which is related to growth of water prices and introduction of water meters.

Main problems related to public water supply in the Volga Basin include:

- drinking water quality

Currently, none of the 444 cities in the Volga basin is supplied with drinking water that continuously meets national standards and WHO regulations mainly due to poor state of water supply distribution systems and inefficient water purification and disinfection. The lack of finance for maintenance and repair as well as for introduction of efficient technologies and facilities for water purification is the main reason of the situation. The priority should be given to microbiological quality of drinking water that in most cases has immediate health impact.

- water losses in distribution systems

  Total water losses in distribution systems are estimated at about 25% of total water supply.

In 2000, 98.3% of cities and 76.2% of urban-type communities in the Volga Basin were equipped with centralized sewerage systems. In 1995 these figures were 96.9% and 67.2% respectively. In 2000, 89.0% of waste waters from urban areas (compared to 82.3% in 1995) and 73% from rural settlements (69.2% in 1995) were treated before their discharge.

Wastewater discharges

The annual volume of wastewater discharge in the Basin is about 20 km^3. Effective water treatment is a top priority. Although, from 1995 to 2002 the total volume of polluted wastewater discharges was reduced by 28.7% (or 3.9 billion cubic meters) as a result of building and upgrade of treatment facilities, introduction of modern production technologies and changing profile of enterprises. Another reason has been in sharp decline in industrial production as a result of economic crisis in the second half of the nineties; discharges might increase with the current economic growth in the basin. In the Volga Basin only 15% of treated waste waters meet national standards.

Major amount of polluted waste waters in the Volga Basin are discharged by:

- chemical and petrochemical enterprises – 26%
- machine building and metal processing – 11%
- ferrous and non-ferrous metals production – 9%
- wood processing, paper and pulp production – 8.5%
- fuel production – 6.5%

Figure 3.: Wastewater discharges in the Volga Basin

The main volume of wastewaters is discharged in the Middle Volga. This corresponds to water use intensity along the Volga River.

Wastewater discharges in the Volga Basin,% *(Protection of the Environment)*	
Upper Volga	15,88
Middle Volga	36,41
Lower Volga	10,15

Analyzing the data on discharges of certain pollutants along the Volga one can note some differences in peak loads. However in general trends look similar and can be illustrated by figures below.

Figure 4.: Pollutants along the Volga

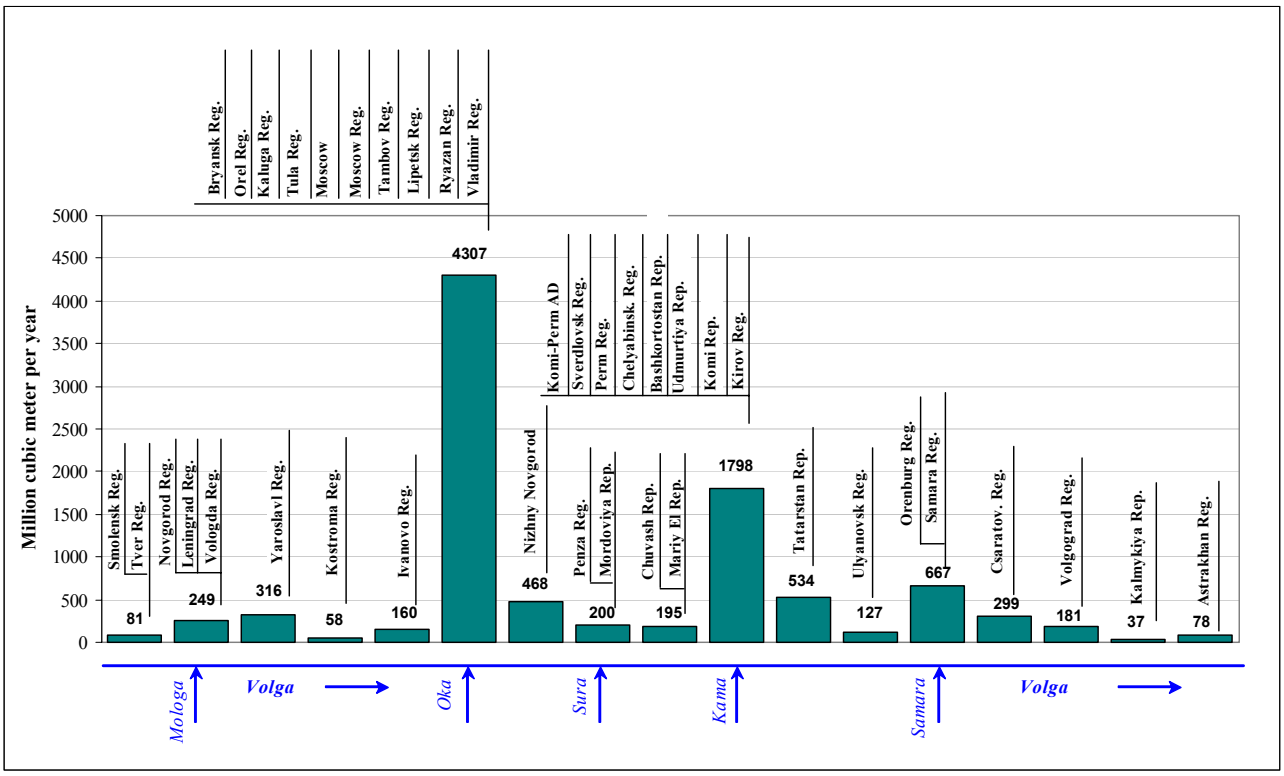
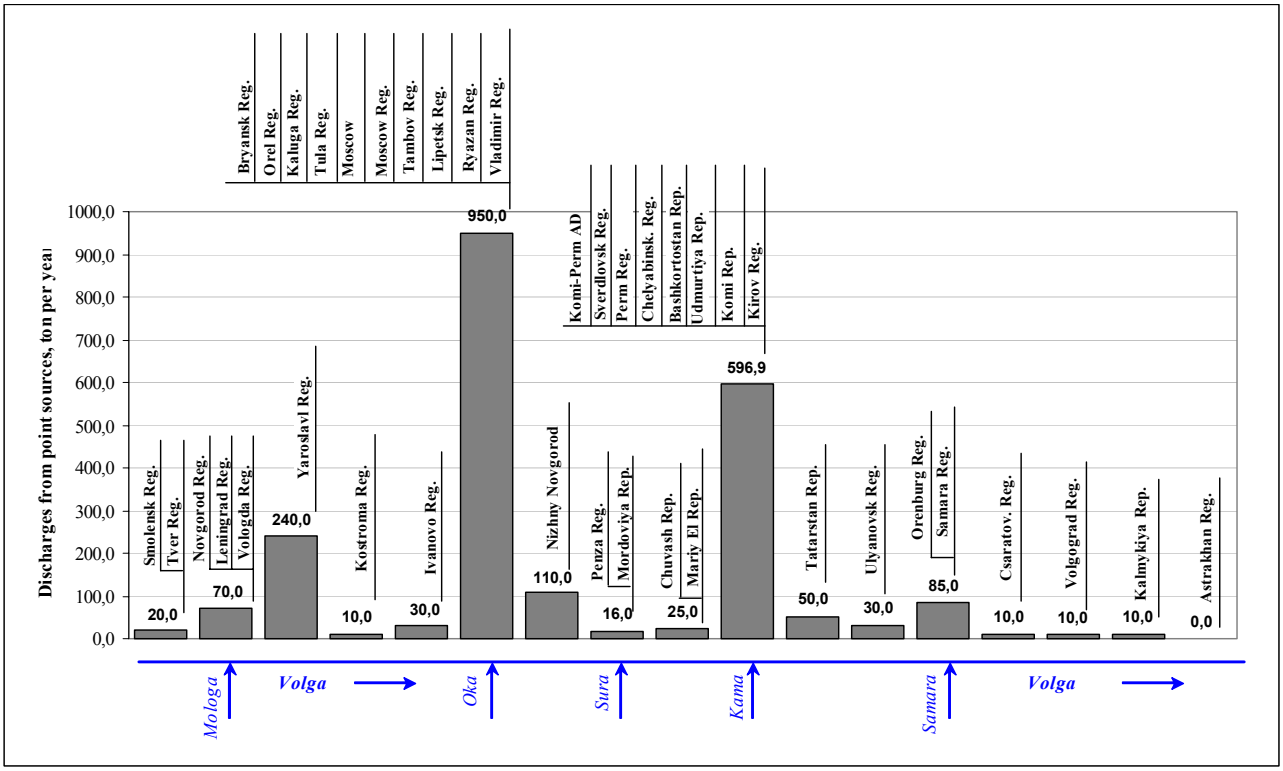


Figure 5.: Total discharges along the Volga River in 2002



Oil products discharges along the Volga River in 2002.

Research performed within the Federal “Volga Revival” Program showed that only 10-30 percent of pollutants discharged were attributed to point sources, while the bulk of pollutants originated from non-point sources, i.e. agricultural and urban runoff.

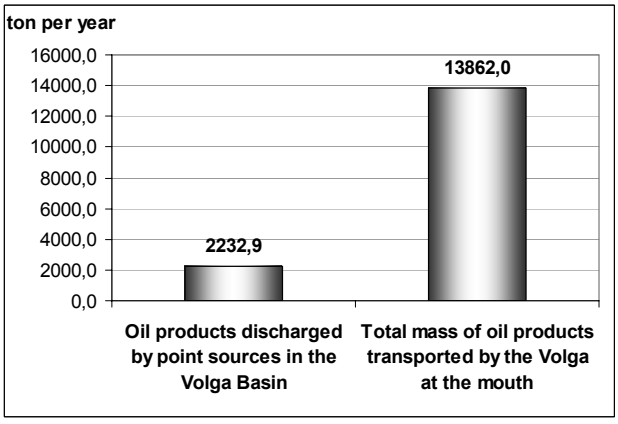
Figure 6.: Pollution load from point and non-point sources in the catchment area of Ivankovo reservoir

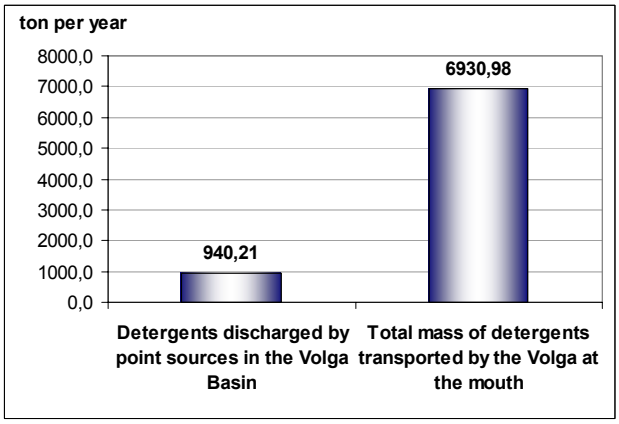
Parameter	Point sources	Non-point sources (agricultural and urban runoff)
COD	6,68 %	93,32 %
Oil products	2,83 %	97,17 %
Nitrogen	17,26 %	82,74 %
Phosphorus	20,10 %	79,9 %

The diagrams given below compare the amount of oil products and detergents contained in waste waters discharged in the Volga Basin and transported by the Volga at its mouth in 2002.

Figure 7.: Oil products in waste waters

Figure 8.: Detergents in waste waters





The main pollutants of the Volga and its tributaries are organic substances, oil, nutrients, phenols, detergents, and heavy metals.

Surface water quality

Water quality in the Russian Federation is assessed according to the standards fixed for particular type of water uses: for drinking water supply, fisheries and recreational use. National water quality standards are presented in a form of MACs (Maximum Allowable Concentrations) of potentially harmful substances for water intakes for drinking water supply.

Officially, according to existing national standards the Volga River is classified as moderately polluted or polluted by Russian standards. But taking into account that many Russian MACs are more stringent than corresponding standards in the OECD countries it is reasonable to presume that the river classified in RF as moderately polluted would be considered as reasonably healthy in Western Europe.

The diagrams below illustrate major trends of BOD and oil products concentrations along the Volga in 1995 and 2002.

Figure 9.: BOD concentrations along the Volga in 1995 and 2002

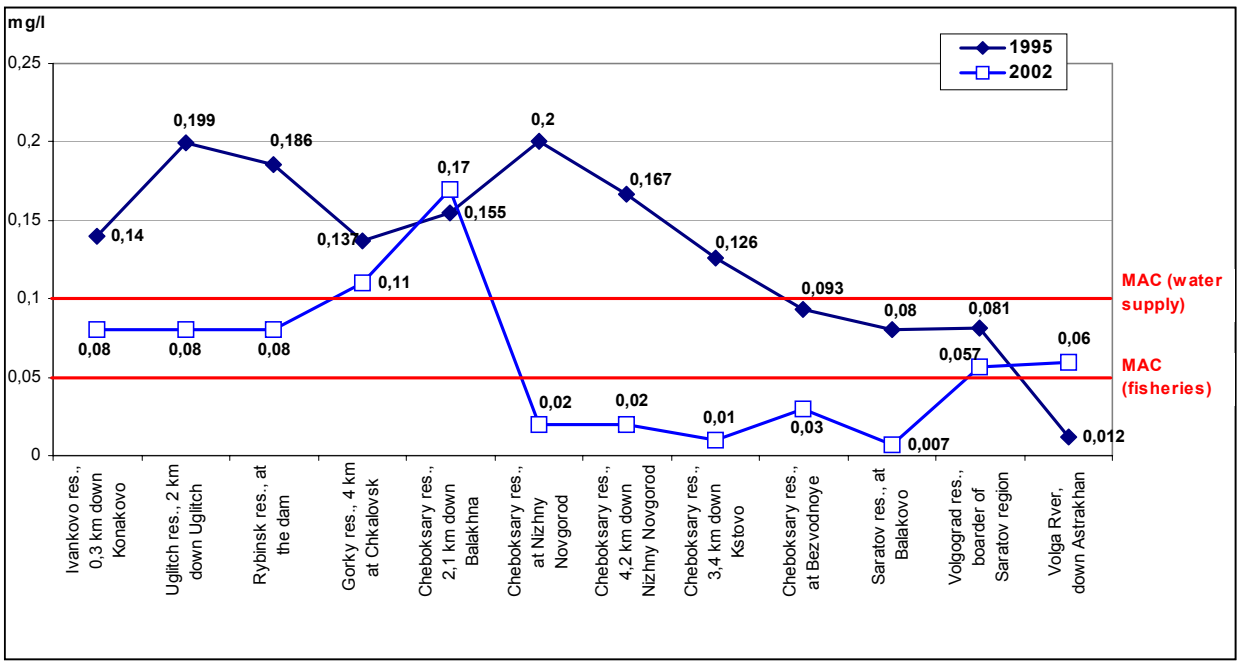
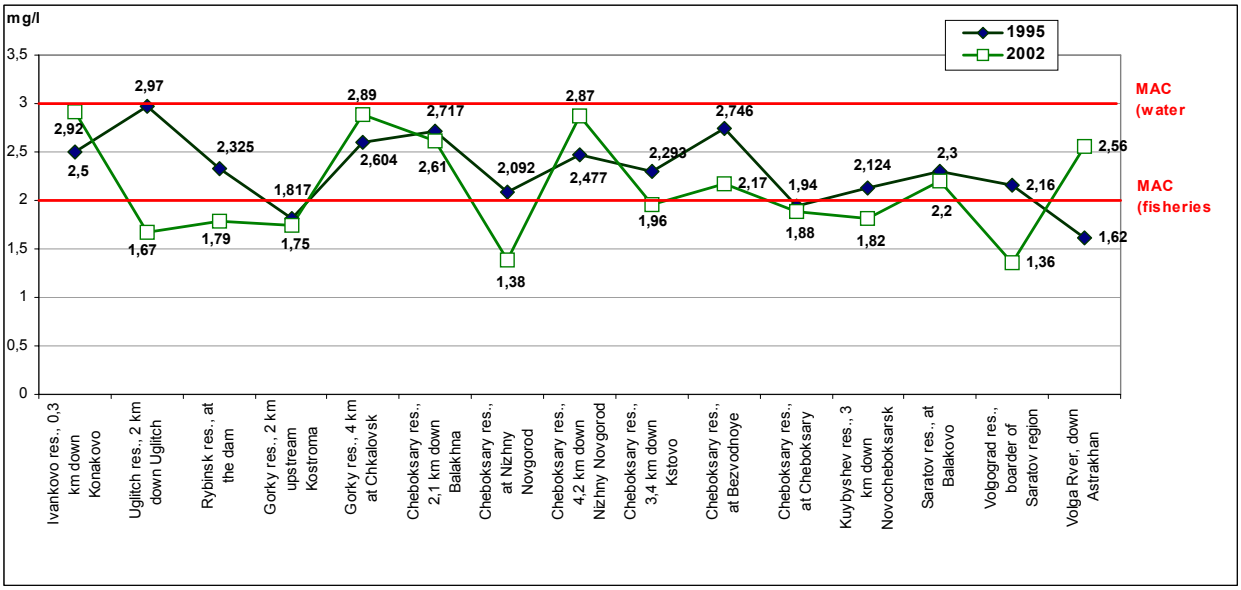


Figure 10.Concentrations of oil products along the Volga in 1995 and 2002



Hydro-biological parameters show that water quality in the Volga reservoirs is beta-mesosaprobic (odor-free water with rich vegetation where most fish species thrive). The saprobic indices for the Volga reservoirs are between 1.9-2.3 and the Volga Delta – between 1.18 and 2.36 *(V. Naidenko. 2003)*.

Hydro-chemical and hydro-biological parameters clearly indicate that water quality is not ideal, but certainly not poor. The data given in the table below show that water quality in the Volga is better than in the Rhine and the Elbe.

Figure 11.: Comparison of pollutant concentrations in the Volga, the Oka, the Rhine and the Elbe Rivers

(Source: Gremm, Heidt and Frimmel from Germany Die grosse Unbekannte: Qualitaet russischer Fluesse, in Chemie unserer Zeit, 2002, Nr. 4)

Parameters	Oka	Volga	Rhine	Elbe
DOC, mg/l	5.8	8.5	2.3	5.6
Ammonium-N, mg/l	0.1	0.2	0.25	0.3
P, mg/l	0.25	0.2	0.17	0.3
Nitrate -N, mg/l	1.3	0.5	3.2	3.9
Cd, µg/l,	<0.05	0.03	0.07	0.15
Cr, µg/l	0.1	0.3	3.8	3.2
Cu, µg/l	6	2.7	5.3	6.1
Ni, µg/l	<2	2.6	3.5	4.2
Pb, µg/l	<1	0.8	1.9	10.7
Zn, µg/l	2.1	34	23	42.2
Hg, µg/l	<0.005	–	0.03	0.12

Sediment quality

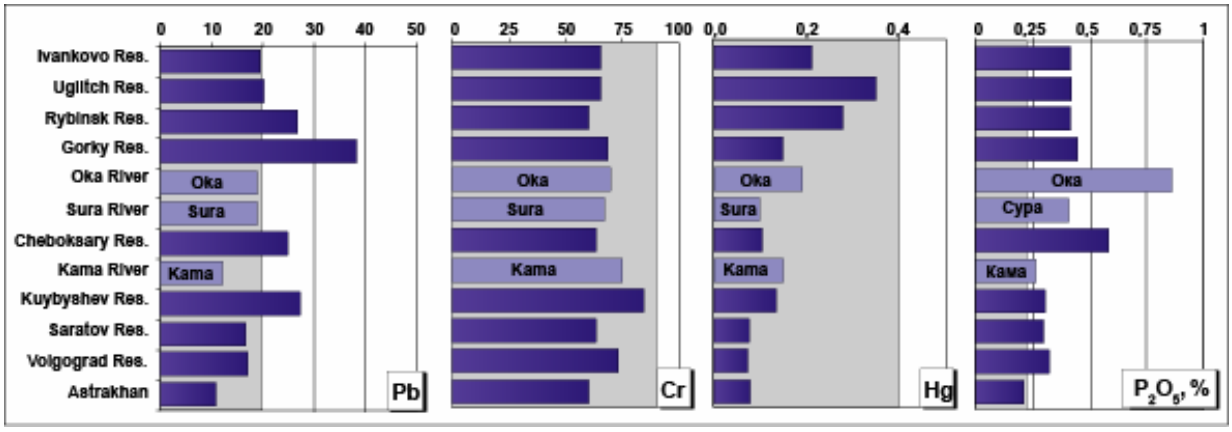
Quality of aquatic sediments is an important parameter reflecting the current quality of water body and providing information for the assessments of anthropogenic impacts during the previous periods of time.

Between 1995 and 2002 field surveys in the Volga River and several of its major tributaries (the Kama, the Oka, the Moscow, the Sura and the Klyazma Rivers) were carried out to investigate distribution of inorganic and organic pollutants in river sediments. Assessments were performed within the joint Russian-German Research project “Volga–Rhein”. Research was based on unified sampling and analytical procedures which resulted in compatibility of sediment quality data along the Volga course between the Lake Seliger and Astrakhan *(G. Müller, et all, 2005)*.

Results of the project show that:

- neither the parameters of central tendency (mean/median), nor the maxima of the measuring give any evidence for a catastrophic situation in Volga-sediments one could have expected;
- heavy metals content is generally higher in the upper Volga sediments compared with sediments of the lower Volga River.

Figure 12.: Composition (mean values) of sediments of the Volga River reservoirs



Composition (mean values) of sediments of the Volga river reservoirs and important tributaries ([mg/kg] except P) compared with the „average shale“ value of Turekian & Wedepohl (1961), serving as the pre-civilizational „geogenic background“ for fine grained sediments (gray)

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3.1.2 Socio-economic Characteristics of the Volga Basin: Regional and Sectoral Overview

Nizhny Novgorod State University of Architecture and Civil Engineering, Russia

Introduction

Environmental management in river basins, in general, and in the Volga Basin, in particular, needs to be coordinated within broader socio-economic regional and national context, including sustainable development issues. Existing 'situational' economic, social and political factors significantly affect river basin management turning it into complex multidisciplinary problem. General socio-economic situation in the Volga Basin defines the specifics and trends in environmental risk reduction and challenges for institutional coordination and cooperation between main stakeholders in environmental problem solving. Thus, the main features in development of institutional coordination and stakeholder participation in environmental protection are rooted to a high extent in current regional peculiarities and situational factors of economic and social development in the basin.

Key activities

Traditionally fishing and navigation had been the key activities along the Volga during last ten centuries. Fertile soils were used for agriculture. Volga basin supplied grain, wood, fur, fish and caviar to the European Russia and to the Western Europe.

Natural resource sectors include forestry, natural gas and oil production. Forestry is important for the northern part of the Volga Basin, including Perm, Komi, Matiy El, Kirov, Nizhny Novgorod, Kostroma, Vologda, Ivanovo oblasts and Udmurt republic.

Natural gas production is developed in Astrakhan, Saratov and Samara oblasts. Oil production has been developing since the 1950s in Tatarstan, Bashkortostan republics and in Samara oblast. New areas are in the Caspian Sea (Astrakhan oblast).

Electricity production is based on fuel burning, hydropower and nuclear power. Eleven hydropower stations are the biggest flatland river hydropower cascade in the world. During the 20th century electricity production was considered as a key priority of industrialization. The Volga-Kama hydropower cascade was constructed as a basis of energy network in the European Russia. Now they are included into RAO UES company.

Industry including machinery manufacturing is developed in all regions of the Basin. The largest enterprises are located in Togliatti (cars), N.Novgorod (cars, lorries, aircrafts, ships), Almetyevsk, Salavat Ulayev, Perm, Ryazan, Kstovo (oil refinery), Izevsk, Tula, Cherepovets (steel), Dzerzinsk and Novomoskovsk (chemicals).

Fishing is important for the Volga reservoirs and the Caspian Sea (Astrakhan and Volgograd oblasts and Kalmykia Republic are famous for sturgeon and caviar).

Agriculture is important for the Upper Volga mainly as grasslands, while the Oka River diversified fertile agricultural land and Middle and Lower areas are famous for crops production.

Service sector in the Volga Basin is less developed than in the EU countries, but it has been rapidly developing since recently.

Population distribution

Population distribution has a concentric structure. The economic core of the Volga Basin is Moscow agglomeration (Moscow city and the Moscow oblast). Its population is approximately 17 million (33% of the Volga Basin total). Centers of 9 neighboring oblasts are located 150-250 km from Moscow. Their development is under a significant impact of Moscow agglomeration. Satellite provinces are: Tula – 1.6, Vladimir –1.5, Tver – 1.4, Yaroslavl – 1.3, Ryazan –1.2, Ivanovo – 1.1, Smolensk – 1.0, Kaluga – 1.0 mln. Total population of Moscow agglomeration and satellite provinces is equal to 27.4 mln that is approximately 50 % of the total Volga Basin population (Federal Agency on State Statistics. Moscow 2004)

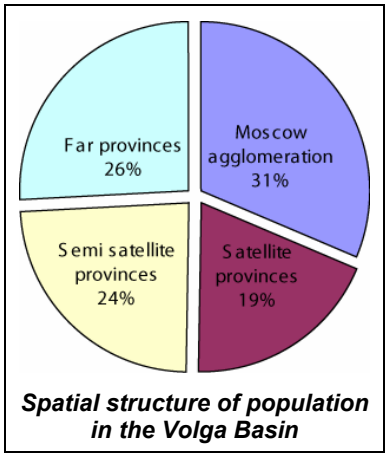
The second circle of provinces includes regions located approximately 400-600 km from Moscow. Semi-satellite provinces are Vologda (including Cherepovets), Kostroma, N. Novgorod, Penza, Mordovia, Tambov, Lipetsk, Orel, Bryansk. Total population of Moscow agglomeration surrounded by satellites and semi - satellites equals to 40.4 mln (73 % of the Volga Basin population).

Figure 13.: Population in the Volga Basin

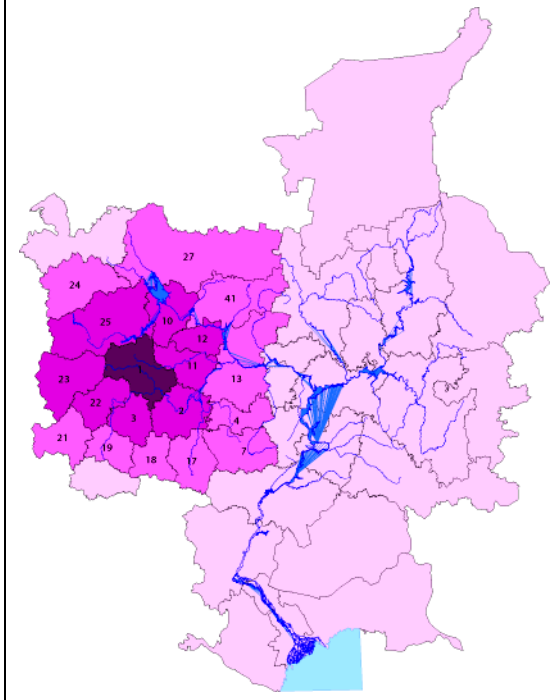
Population is key factor for resources use (water, fuel, metals). Population of Moscow agglomeration is 31 % of the whole Volga Basin population.

Oblsts and republics ranking next to Moscow:

Bashkortostan	4,0 mln
Tatarstan	3.7 mln
N.Novgorod	3.5 mln
Samara	3.2 mln
Perm	2.8 mln
Volgograd	2.7 mln



Spatial structure of population in the Volga Basin



Population distribution

Usually, the general destabilization of environment is directly linked to deterioration of human health, social problems and demographic profile. Among current social and demographic risks, and hence societal vulnerabilities in the Volga Basin which are common to many other Russian regions is that significant part of population lives in poverty – about 43% of population in the Volga Basin has income lower than subsistence level and about one third of its population is unemployed or is in informal sector of economy. Perhaps among the most alarming symptoms of human insecurity is depopulation, which has been increasing since the early 1990s. Currently, the mortality rates in the Volga Basin are higher than the birth rates, while life expectancy (66 years) has also declined during the last decade[7]. The level of urbanization in the Volga Basin is quite high: about 74% of its total population[8] lives in 445 cities[9], or urbanized areas. Among priority current issues is the revival of small towns[10] of the basin with their valuable traditional occupations, history, culture and knowledge of the local public; they are expected to serve as the centers of tourism and recreation.

Regionalism

What makes regions like Tatarstan republic, Samara and N.Novgorod oblasts comparatively more influential actors in the Volga Basin?

During the Polish invasion in 1612 N.Novgorod had been the core place of resistance. Public movement conducted by N.Novgorod citizen Minin united Russian multinational society. N. Novgorod International Fair had been the biggest in Europe in 19th century.

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[7] At the beginning of the 21st century Russia ranked first among developed countries on the mortality index and it ranked 51st in the world for average life expectancy.

[8] Total population in the Volga Basin accounts for about 57 million.

[9] Seven cities in the Volga Basin has population over 1 million – Moscow, N.Novgorod, Samara, Perm, Kazan, Ufa, Volgograd.

[10] Population below 50 thousand people

Kirov, Mariy El, Chuvash republic and Mordovia are traditionally connected to N.Novgorod as satellites. At the start of economic reforms of the 1990s N.Novgorod was considered as one of the most successful regions. Nizhniy Novgorod is a capital of Privolzhsky Federal district now. It makes Nizhegorodskaya oblast more independent and attractive to neighboring areas as a regional centre.

Tatarstan republic with its capital in Kazan is considered as the Russian centre of Islamic world. It is more independent than other Russian regional centers since 1991. Social oriented reforms during the last decade of the 20th century helped people to survive in crisis. Today its GRP exceeds its level of 1991.

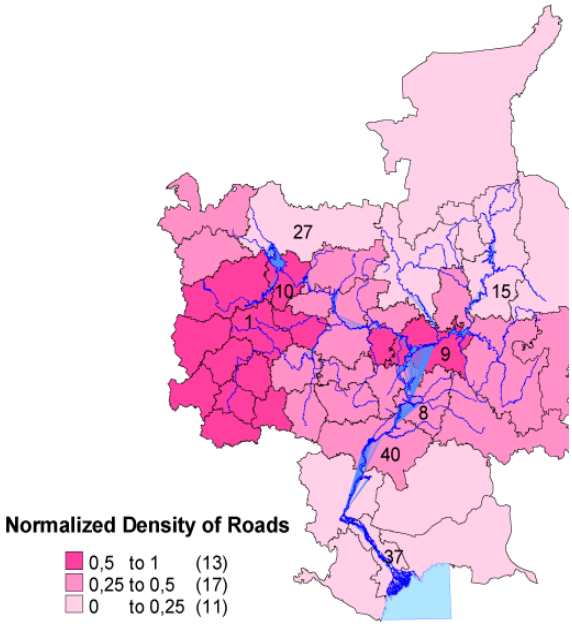
Samara has been the temporary capital of the Soviet Union during the World War II. It used to be the international fair centre during 19th century. The biggest Russian car plant is located in Samara oblast. Samara is the leading regional exporting centre in the Volga Basin after Moscow city.

Tatarstan and Samara are located quite far from Moscow (800 km). Tatarstan, N.Novgorod and Samara are located at intersection of West-East and North-South transport corridors. Samara has good railroad infrastructure and the airport.

Transport infrastructure density

High road density is registered along the West-East direction. Water ways are situated in North South direction. There are at least four points of intersection of West-East and North-South directions.

Figure 14.: Road density



Moscow, N.Novgorod and Kazan are located in the Pan-European corridor Berlin-Moscow-Ekaterinburg.

There are several specific features characteristic for the main leading regions of the Volga Basin:

- Moscow agglomeration: highest road and railroad density in the RF, river port is connected with Volga by the Moscow canal;
- N.Novgorod: European West-East transport corridor intersection with North-South water ways, the biggest Volga river port;
- Kazan agglomeration: European West-East transport corridor intersection with North-South water ways, but weak railroad infrastructure;
- Samara agglomeration: the best railroad infrastructure located close to the Volga, highway coming from Moscow to Kazakhstan parallel to the European transport corridor. Samara has good communications with the Black and the Caspian Sea

Road density is important factor in competitiveness between Tatarstan, N.Novgorod and Samara for regional leadership; currently Tatarstan has a priority in that respect.

Figure 15.: Investments per capita

Leading federation subjects for per capita investments are:

- Astrakhan and Leningrad oblast (located close to international waterways)
- Moscow agglomeration
- Tatarstan, Udmurtia, Perm& Samara (multisectoral economics including processing industry)

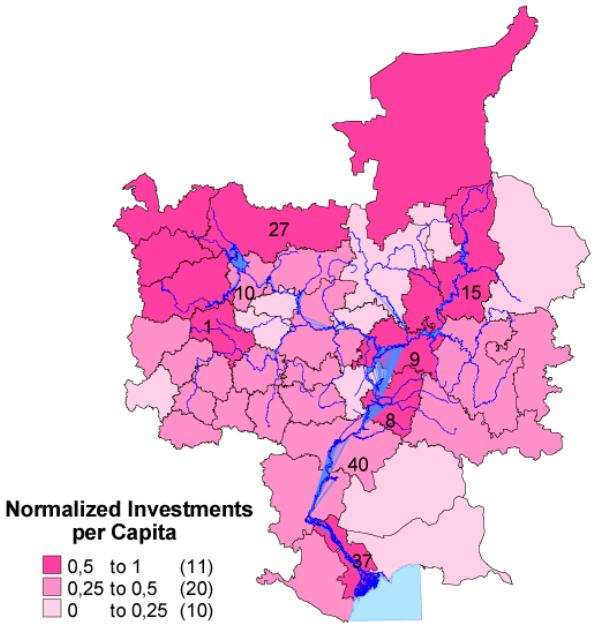


Figure 16.: Export per capita

Moscow agglomeration is the leader exporting 1,850,00 USD per capita

Samara	**1576**
Vologda	1297
Orenburg	1048
Tatarstan	974
Perm	845
Tula	589
Nizhny Novgorod	526

Figure 17.: Export per capita / GRP per capita

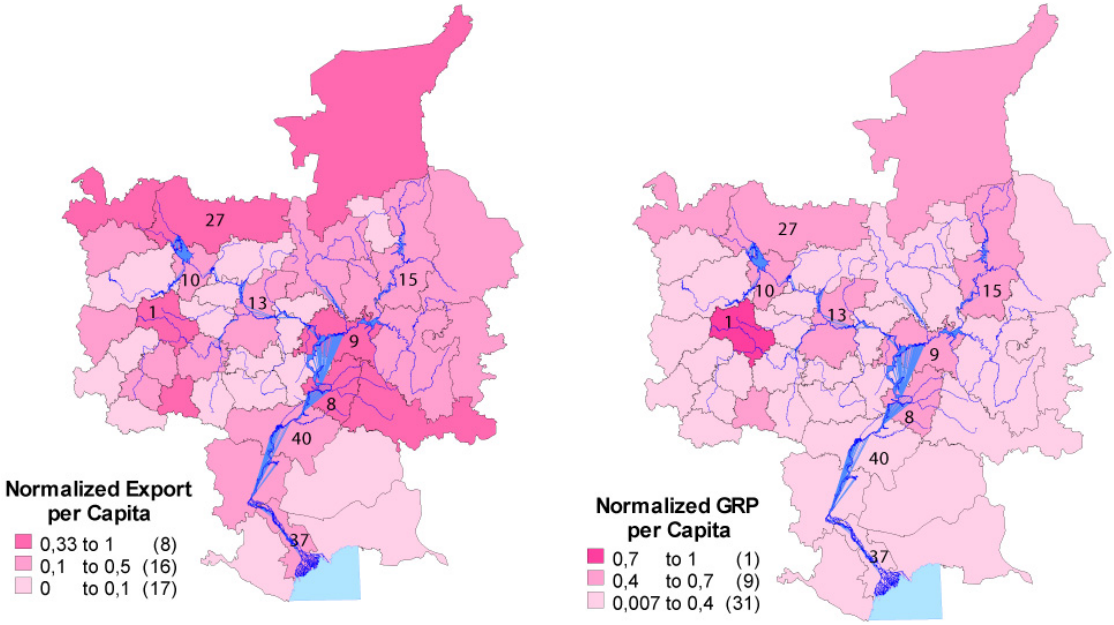
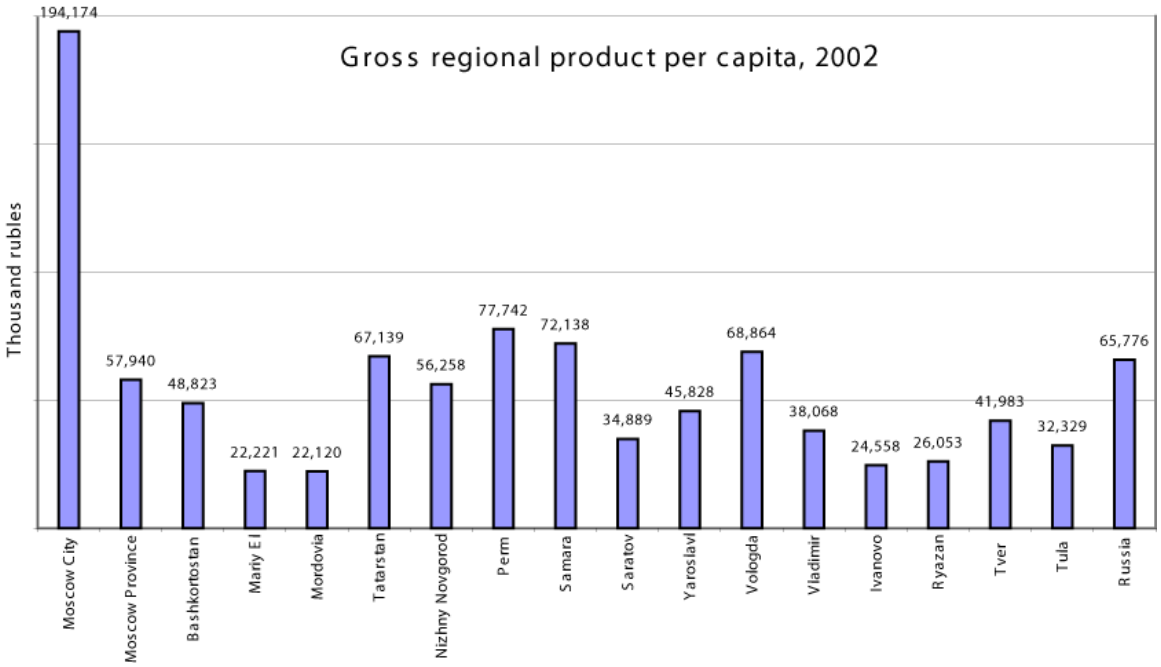


Figure 18.: GRP per capita, 2002



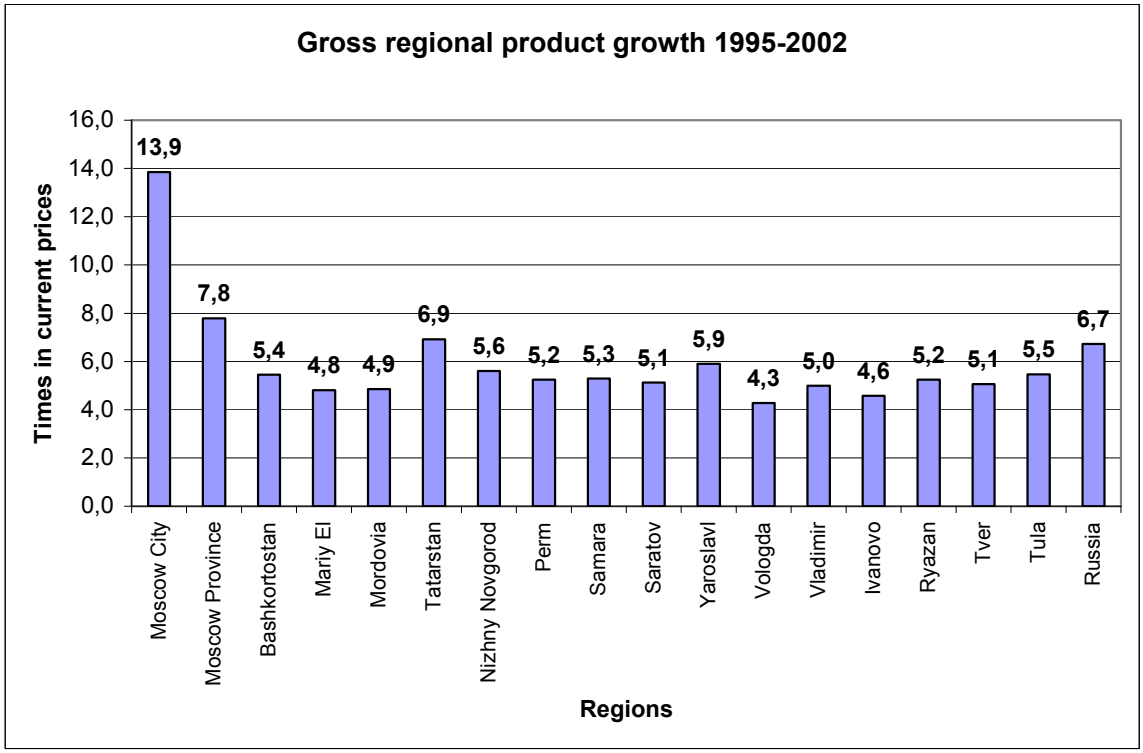
GRP per capita exceeds the national average in Moscow, Perm, Samara, Vologda oblasts and Tatarstan republic. Several cities and federation subjects in the basin like Ivanovo, Ryazan, Mordovia and Mariy El are ranking as depressive areas. GRP per capita is twice lower than the Russian average. They urgently need deep structural reforms and new vision for their development.

Moscow city, Moscow oblast and Tatarstan republic are the fastest growing economies in the Volga Basin. Moscow city, Perm, Samara, Vologda, Moscow oblasts and Tatarstan are considered as leaders in the Volga Basin. N. Novgorod oblast has been loosing its formerly leading role during the last decade.

Per capita GRP (Cities)

Moscow agglomeration, Tatarstan, Samara, Perm and Komi are the leading regions for per capita GRP levels. Among Moscow satellites Bryansk, Kaluga and Ivanovo oblast are less successful regions. Belt of low income regions spreads from Tambov, Penza and Mordovia to Chuvash and Mariy El.

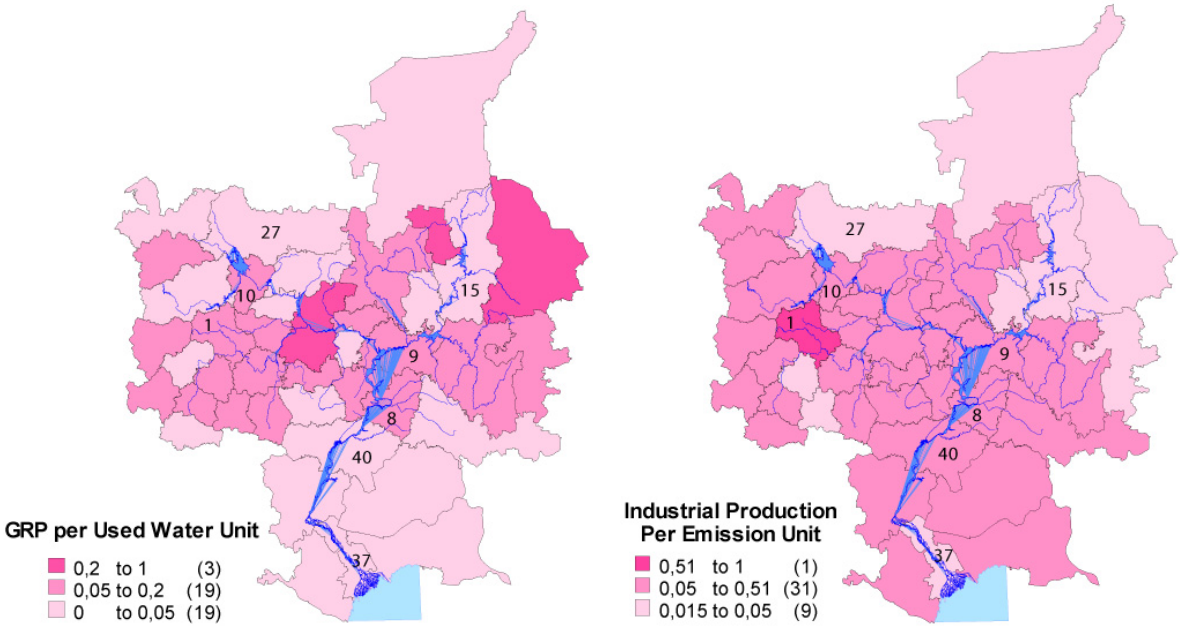
Figure 19.: Gross regional product growth 1995-2002



GRP and water consumption

Moscow agglomeration is characterized by high indicators, while N.Novgorod and Tatarstan are moderate water users. The Lower- and the Mid- Volga regions where agriculture, natural gas production and industry are developed are consuming more water because of old technologies and inefficient management. High rates of water use are registered in Kazan, Moscow, Cherepovets, Yaroslavl and Perm.

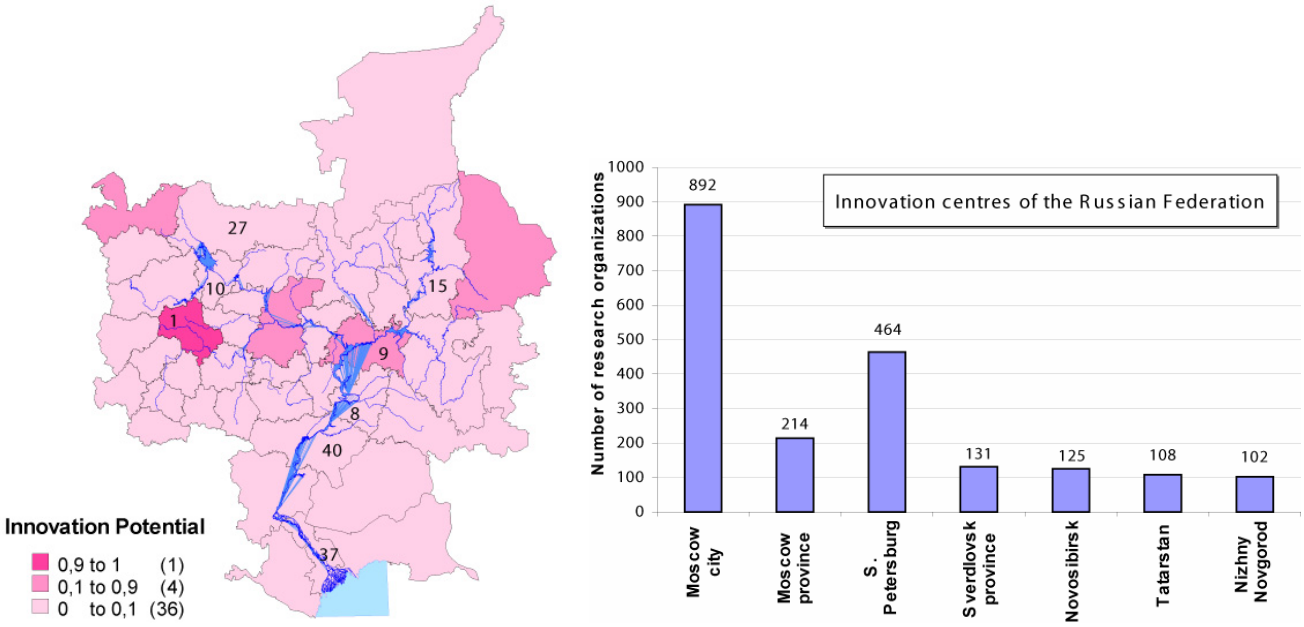
Figure 20.: GRP per water unit and industrial production per emission unit



Innovation centers

Innovations centers in the Volga Basin are concentrated mainly in Moscow city and Moscow oblast, Tatarstan republic and N.Novgorod.

Figure 21.: Innovation centers of the Russian Federation



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3.1.3 Inland Water Transport and Water-ways in the Volga Basin

Cadaster, Russia

Introduction

The Volga is the main inland water-way in Russia which connects via the system of canals the Baltic, the Black, the Caspian and the White Seas. Annually, it is free from ice for 200 days in the north and up to 260 days in the south. During the navigation period the Volga carries about 70 percent of all inland water-way traffic in Russia. According to estimates in 2005 total freight amounted to 87 million tones. There are more than 900 ports and 550 industrial docks along the river.

During navigation period more 300 ships of the Volga Ship Company (VSC) are functioning, including about 50 of "river-sea" category, 63 automotive ships for river freight transport, 70 barges, more than 50 comfortable three- and four- level decks

ships. In 2001, VSC took part in establishing V.F.Tanker, Ltd that exploits more than 40 ships for oil products transport. Volga-Flot-Tour Co, the VSC subsidiary is successfully functioning in river-tourism sector.

Qualitative changes in navigation

In the middle of the 19th century navigation was carried out along all rivers in the Volga Basin accessible to ships. In the early 20th century navigation was terminated along small rivers. To the end of the 20th century some medium rivers were considered to be unreasonable for maintaining navigation along them. Ferries and winch ferries keep navigation across the rivers. In the 20th century the Volga basin became a part of a water way system which includes basins of the Volga, the Don and the Neva and links five seas. Rail road and motorcar road network was developed in the upper and Middle Volga basin. Dams erected on the Volga helped to maintain high water level during navigation. Large multimodal terminals exist in main cities of Volga-Caspian region but their load is not high. Nowadays inner water transport of the Volga-Caspian region has the following functions:

- Construction materials transportation to the medium distances
- Oil and oil products transportation to the destinations not covered with pipelines. This activity is expected to spread all over the region to meet oil production growth in Caspian region.
- Suburban passenger conveyance (new bridges erection reduces river passenger conveyance)
- Growing tourist conveyance
- Multimodal transportation

The major problems of the Volga river transport competitiveness include:

- Seasonal specifics and low speed of river transport;
- Absence of unified logistical schemes to integrate different types of transport;
- Significant number of artificial dams along the Volga limit transport mobility;
- Modest financial support by the government;

Economic and environmental issues

River freight transportation is considered to be the most cost effective (in 2002 transportation costs along inner waterways accounted for 204 kopeks/ton-km, by railroad – 226, by motor transport – 2196. Passenger conveyance costs by river transport reached 2280 kopeks/10 passenger-km, by motor transport – 388, by railroad – 244. Use of ferries and winch ferries leads to extra expenses. Ferries are mainly used to get to settlements with no bridges and roads connections.

River transport is a source of water pollution. It discharges waste waters from ships and sewage from their clean-up, as well as polluted waters after engines cooling. It is also a source of air pollution from boilers and engines.

During the recent couple decades considerable attention has been paid in Russia within the river transport sector to enhancing ecological safety. Special ships to collect waste waters had been constructed; collection of solid and liquid wastes had been introduced on all passenger ships and on a number of freight vessels; ports along the Volga are equipped with wastewater collection facilities with their further transfer into municipal collectors.

Among serious problems is that land degradation, deforestation and lack of proper attention to water-way maintenance (river bed cleaning, fairway deepening, etc.)

negatively affect particularly small and medium rivers. They became shallow and unavailable for navigation.

Railroads in the Volga-Caspian region

In 2002, the length of railroads in the Volga-Caspian region in Russia accounted for 34222 km. Nowadays railway is used to convey variety of goods. In 1990-2000s no new railway construction was underway in the region, except for the branch line from Yandiky station to a new port Olya (Astrakhan). Railroad all over the Volga Basin is expected to be transferred to electric power.

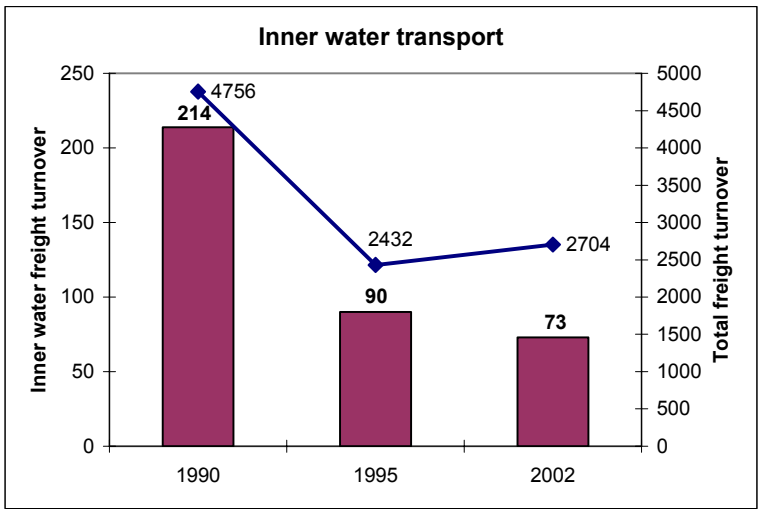
Railroad spatial structure has roads both of West- East and of North-South directions. The major part of freight in Volga-Caspian region is carried by railroads which go along and cross the main rivers. The highest density of railway network in the Volga-Caspian region is in Moscow oblast and around Samara while the minimum density is registered in the Kama and the Vyatka basins and in the Lower Volga area.

Motorcar transport and roads

The share of motor transport in Russia accounts for 6.1% of all freight turnover and for 40% of passenger turnover (excluding intra-urban traffic). For all that substantial amount of passenger conveyance with private vehicles wasn't taken into account. Thus buses and vehicles prevail in conveyance of passengers.

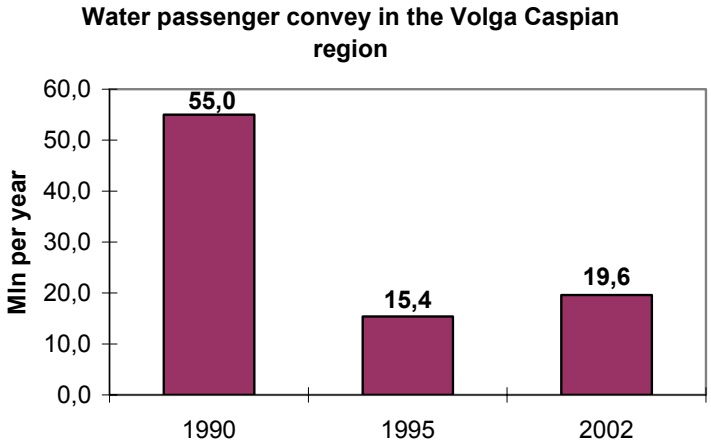
About 10.7 m llion private vehicles were registered in the Volga-Caspian region in 2002 (about 200 vehicles/ 1000 inhabitants) which is 2.5 times higher than in 1990. Road density is high in the middle Volga. Rapid growth in the number of vehicles and slow road network development causes environmental deterioration in the Volga-Caspian region. Lack of bridges across the Volga, the Oka and the Kama is an obstacle to motorization of the Volga basin. Nowadays there are 23 motorcar bridges and 13 railway bridges downstream from Tver that are available for traffic across the Volga.

Figure 22.: Inner water transport



A half from about 20 million passengers conveyed in 2002 by inner water transport in Volga-Caspian region was transported in the Volgograd oblast. Construction of a new bridge in Volgograd would significantly reduce the intensity of river transportation. High costs are the main reason for cutting down the passenger conveyance network. Future of river passenger conveyance is predictable: costs are significantly higher than for on-land transportation.

Figure 23.: Water passenger convey in the Volga-Caspian region



Water tourism

Among three major types of passenger transport, i.e. tourism, passenger convey and local commuting lines, only tourist cruises are profitable. That was the reason for closure in 2006 the regular passenger lines between Moscow and Astrakhan; the volume of local passenger river transportation is declining. The ticket fees are established by the government with partial financial subventions. However, the real costs of river fleet within passenger transportation sector are four times higher than these subventions.

Tourist communication is developing rapidly along the rivers and canals. Long distance tours from Karelia to Astrakhan are available now during navigation period and they are very popular both domestically and internationally.

Problem-solving

Inner water transport of the Volga-Caspian region is not integrated into the transport system of Russia and of Europe. This is the main obstacle to inner water transport development.

Lack of rail road network in the Kama basin and in the Lower Volga is a reason for assessing prospects of inland water transport development. Mixed rail-and-water conveyance prevails in areas with undeveloped railway network like Siberia and in the Russian northern territories. Europe has good experience in multimodal freight via large rivers and canals. Another obstacle is environmental concerns: deforestation and ground-water use results in water level decline and making the rivers shallow. A number of means for problem-solving can be outlined:

- River basin reforestation to protect rivers from shallowing is important. Regulation of ground-water consumption, especially in the Moscow area and in the Oka basin is necessary.
- Development of logistic network infrastructure for the entire Volga Basin provides a niche for inland water transport. Most successful development could be linked to areas of highest road density and to river-sea ports like Astrakhan
- Erection of new bridges over the Volga, the Oka and the Kama. It would result in cost reduction and decline in a number of ferries. Emission of pollutants by ferries would be reduced.
- Strict control for private small boats use is essential.

- Reconstruction of the Volga, the Kama and navigation canals locks.
- Development of new inexpensive high-speed vessels for passenger conveyance along intercity lines. It will help to restore passenger communication on the Volga and its main tributaries.

3.1.4 The Lower Volga, the Delta and the Coastal Zone

KASPMNITZ, Russia

Introduction

The Volga River flows into the Caspian Sea, forming a huge Delta with its area of about 45 sq.km. The Lower Volga is often considered as an important section of the Volga basin concerning its environment. It consists of the Volga Delta and the Volga –Akhtuba inundation fields surrounded by steppes. The biodiversity of the Delta area is of a global importance. The Volga carries 80 percent of the freshwater inflow to the Caspian Sea along with usual nutrients and polluting substances. The major environmental problems in the Delta include decline in commercial fish stocks, deterioration of environmental quality, degradation of coastal landscapes, loss of coastal habitats and decrease of the health of population. The Volga Delta is in and surrounded by Dagestan, Kalmykia and the Astrakhan oblast, while the Lower Volga flows through the Volgograd oblast.

Biodiversity

Biodiversity of the Lower Volga region is of global importance and the Delta wetlands are considered to be the best conserved in Europe (The Volga Vision, 2003). A part of the Volga Delta is included into the Astrakhan Biosphere Reserve and approximately half of the estuary (sea-side) as the Ramsar Site (800,000 ha). At least fifteen globally endangered bird species are registered in the Lower Volga, while four of the sturgeon species included in the IUCN Red List have spawning and feeding grounds in this area. One salmon species is on the brink of extinction.

Fifteen rare bird species are listed in the Red Book of the Russian Federation. Relict plant species from the national Red Book together with at least twenty endemic fish sub-species are the characteristics of this area. Three globally significant bird migration routes run over the Volga Delta; it is estimated that 7 to 10 million water birds annually use the area in spring and fall respectively.

Fisheries

The river provides significant commercial fishing. The Lower Volga and the Northern Caspian are among the largest fishing areas of the country accounting for about a half of domestic inland water fish catches, including about 70 percent of sturgeons. The area from Volgograd to the Northern Caspian provides the spawning grounds of sturgeons and semi-migratory fish species. Along with natural reproduction of fish in the Lower Volga, artificial reproduction of fish is widespread as well (hatcheries, fish farms, etc.). These hatcheries produce over 50 million fry of sturgeons and semi-migratory fish each year. However, only about 1 percent of fry survives due to their high vulnerability.

Thus, the region serves as a spawning area and provides nutrition sources for the majority of migratory and semi-migratory fish of the Caspian Sea and the Volga River, including globally threatened and highly valuable sturgeon species. Construction of the reservoir cascade on the Volga resulted in a loss of spawning grounds, and its stocks are supported now only through artificial breeding. Spawning grounds of sturgeons are conserved within the Volga-Akhtuba floodplain and in the Delta. The presence of natural spawning grounds is a necessary condition for conservation of the gene pool of these fish species.

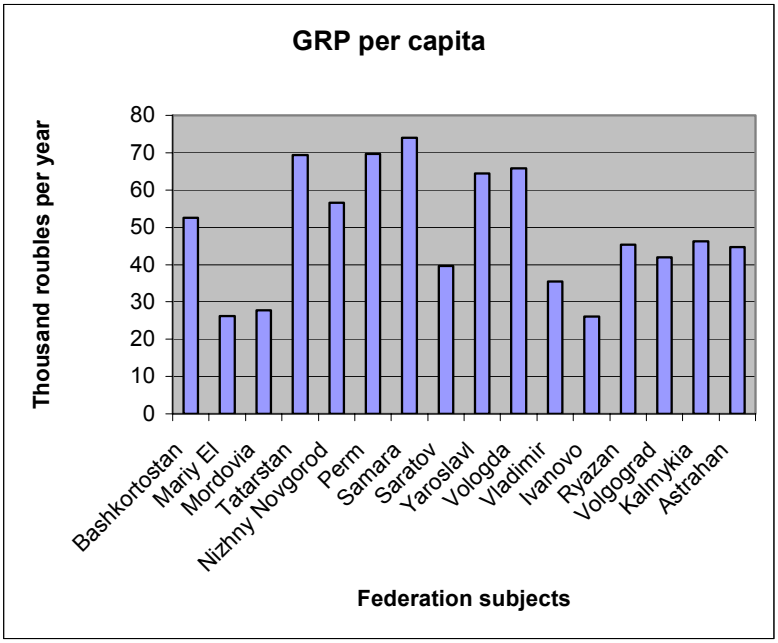
Oil and gas developments

The importance of the Lower Volga region is growing in the field of oil and gas exploration and extraction (The Volga Vision, 2003). In general, gas reserves in the Astrakhan oblast are estimated at 6 trillion cubic meters, condensate – 1.2 billion tons, oil – 7 million tons. At present, about 10 percent of oil and condensate and approximately 6 percent of the total gas production in the Russian Federation is extracted here. It is estimated that, at current rates of extraction, the largest Astrakhan gas condensate deposit may be exploitable for 100-150 years. Energy sector provides a large potential for development of the infrastructure and associated sectors. According to economic forecasts, development of the oil and gas industry would provide tens of thousands of jobs in the region, which would help to reduce the level of local unemployment and social tension. Natural gas and oil production has a variety of implications for sustainable development of the region.

Socio-economic development

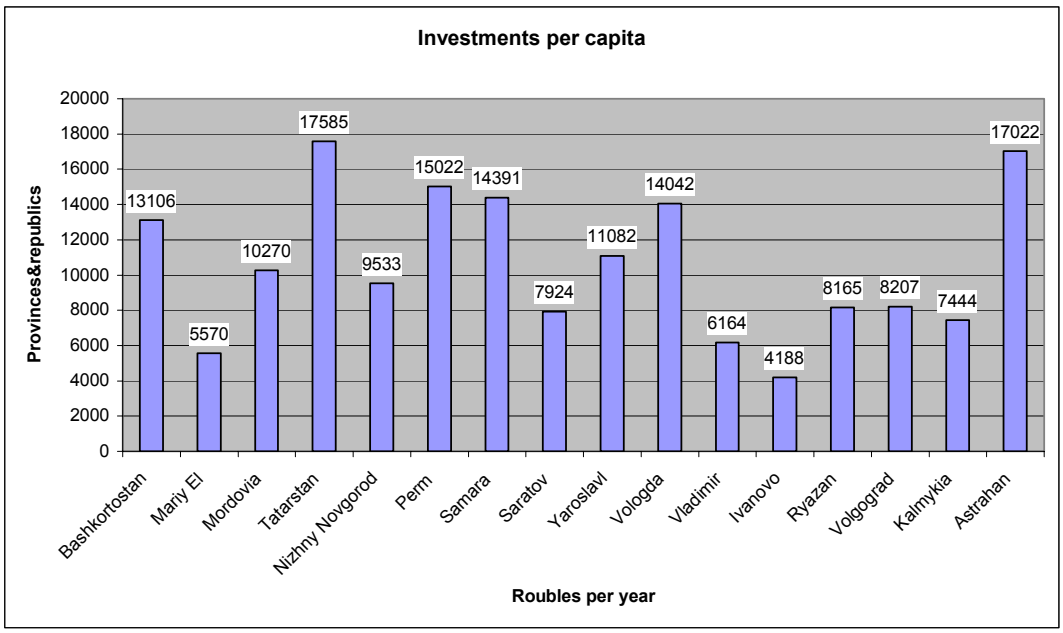
The socio-economic situation in the Lower Volga region is much more desperate than in most other parts of Russia. The reason stems from the previously low level of economic and social development. GRP in the Lower Volga region is 1.5 fold lower than its national average in Russia (Federal, 2004).

Figure 24.: GRP per capita



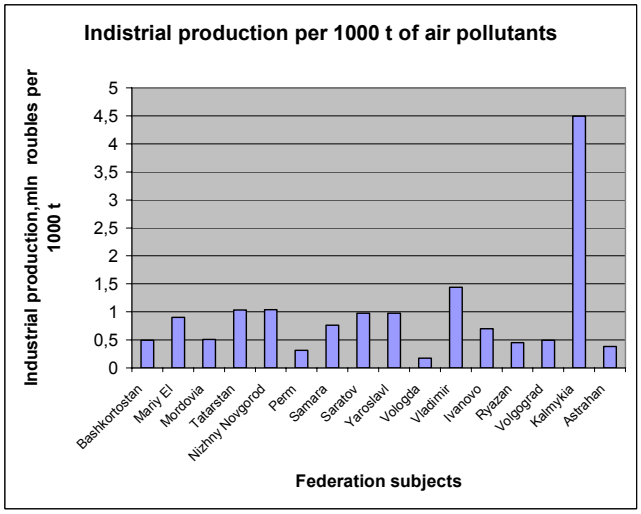
Export per capita in Astrakhan oblast is lower than the Russian average, but situation is expected to change with increase of oil and gas developments. High investment potential is a characteristic of the region. Investments per capita in Astrakhan oblast are higher than the Russian average.

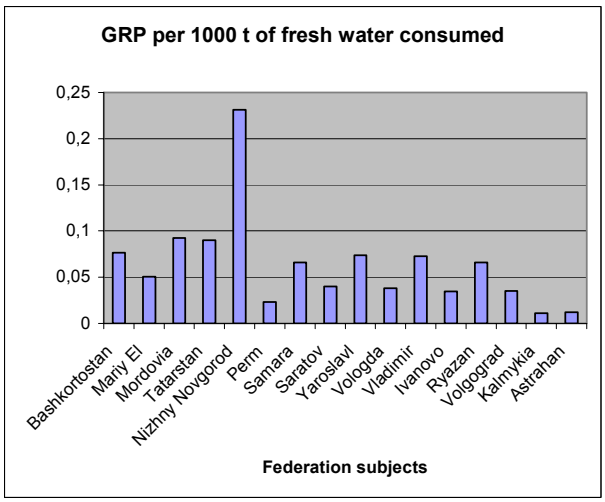
Figure 25.: Investments per capita



Natural resources are the core of the regional socio-economic development. Their extraction and processing cause great load on environment, including air and water pollution and result in high levels of water consumption. High level of air pollution negatively affects the health of the local population.

Figure 26.: Industrial production vs. air pollutants and fresh water consumption





An agricultural economy prevails in Kalmykia and Dagestan; the number of unprofitable enterprises in their industrial structure is very high (respectively, 71 and 64 percent). Priorities for economic development in the Astrakhan oblast are oil and gas extraction and processing, pipeline transportation, shipbuilding, fuel industry and fisheries. Compared to other Caspian regions, the Astrakhan oblast is characterized today by a relatively high level of economic development. However, the housing situation in the oblast is still fairly bad, and it is improving very slowly. Only about 30 percent of households in the oblast are supplied with water, sewage, and central heating, and that figure drops to less than 10 percent in the coastal zone. In rural areas, no more than 10 percent of households are supplied with gas.

Over the last ten years, public health has deteriorated and incidence of certain diseases has increased. This is due to the decline in living standards resulting from the economic crisis, as well as decline in essential services such as drinking water supply.

Environmental problems

The reasons for coastal landscapes degradation include economic pressures, sea level fluctuations (including surges), climate change, flooding and desertification. Loss of bio- and genetic diversity is mainly a cause of land-use changes, including non-rational use of agricultural lands and the introduction of alien species.

Individual, non-group tourism has long been an attraction for both local population and outsiders. The major attractions include fishing, hunting and recreation. Extensive development of commercial tourism is emerging in the region as a new type of economic activity. In general the region has a large potential for tourism development. However, ineffective management of tourism and recreation may lead to destruction and degradation of nature, decline in natural reproduction of the fauna and flora and physical disturbances of ecosystems and individual species.

Effectiveness of fish reproduction is defined by the size of flooded area and the flood regime. The area of spawning grounds in the twentieth century underwent significant changes. In the 1930-1940s, it occupied 700,000 ha and was fully flooded by the Volga in spring and summer. Now the total area of spawning grounds in the Volga Delta declined to 525,000 ha, out of which 465,000 ha are located directly in the Delta and 60,000 ha in the lower part of the Volga-Akhtuba floodplain.

With a flow volume of 130-110 km^3 in the second quarter of a year, the highest water level in the Delta reaches 565-561 cm, which allows flooding of the entire spawning grounds and hay fields. In years of high water, all the lands in the Delta and floodplain are flooded compared to 60 percent in years of low flow.

The spawning area in the Delta depends on two main factors: the magnitude and duration of the spring flooding period, and the existence and management of suitable spawning grounds. Effectiveness of fish reproduction also depends on the duration of the fry feeding period in the spawning grounds, itself determined by the water level of the Volga in spring. In years of high water, the duration is between fifty and seventy days. Over that period the fry develop enough to migrate downstream. In years of low water, the duration of that period decreases to thirteen to twenty days, and in years of extremely low water, only seven to nine days. This leads to mass mortality of fry in remaining water bodies.

According to official statistics, annual sturgeon catches declined from 11,000 tons (1910-1930) to 1,800 tons (1996-1998), and total commercial catches declined by almost five times due to over-fishing and poaching, loss of spawning grounds, and disturbance of the fishes' food base. Moreover, the Caspian states have no regional agreement on sustainable catch limits, nor do they have a general pricing policy for the export of fish and caviar.

Natural fluctuations of the Caspian Sea water level affect the coastal zone significantly. Throughout history, habitats and species have had continually to adapt to naturally changing hydrological conditions. During the last century, however, the natural dynamic cycles have been modified by human interventions such as dam construction and reservoir development, industrial water usage, the construction of dikes, drainage of wetlands, and other changes. It is widely shared view that the effects of climate change can be added to these drivers. The recent increase of the water level in the Caspian Sea (up to 2.5 m) resulted in changes in the feeding and breeding conditions for many mammals and water birds, and a loss of shallow aquatic areas. Habitat loss was compensated to some extent through its shift inland. However, no effort was made to restore the wetlands on former agricultural lands.

Sources of aquatic pollution are located both within the Lower Volga region and upstream. The main sources are municipal, industrial and shipping waste discharges; agricultural runoff and drainage waters; pollution risk from hydrocarbon developments is high. Although current levels of aquatic pollution are not yet a major threat, the forecasts suggest that an increase in economic activities in coming years may result in increase of water pollution. Moreover, there is a lack of reliable scientific knowledge on the interrelation between pollutants and biodiversity, and monitoring results of current

pollution levels are insufficient. There is a lack of regulatory rules and methods for biodiversity assessment within existing procedures of environmental impact assessments, and so far there are no approved ecological limitations on hydrocarbon exploration and extraction in the Northern Caspian and the Volga-Akhtuba floodplain.

Poaching has become another scourge for fish resources. According to data from fish protection agencies, the volume of sport fishing equals to industrial operations. The following factors have been identified as likely reasons for poaching and overuse of natural resources: lack of other forms of employment, commercial gain, meeting local food needs, and recreation. Subsistence hunting and fishing is clearly increasing as overall economic condition is worsening, especially in rural areas. Poaching for sturgeon and other commercial fish species has increased over the last years as a result of high profitability of this "business" and insufficient controls. Every year it becomes more and more difficult to control poaching due to the lack of modern equipment at inspectorate services. Sometimes violations even by employees of management and control agencies are registered.

Public awareness and participation

One of the serious concerns related to environmental problem solving in the Lower Volga is the lack of a developed civil society as a driver in environmental clean-up and biodiversity conservation in the region. Its role in ecological decision-making is quite low. Sociological surveys carried out in the Lower Volga region during 2002-2004 indicated that although a large part of population (80 %) was not satisfied with the present environmental situation and was preoccupied with the state-of-the-art in environmental protection, only 16 % of respondents agreed to take part in actions and activities of environmental organizations aimed at environmental amelioration.

Most respondents believe that government and local authorities are responsible for the present environmental situation, and that government is not able to solve environmental problems. Heavy reliance on the state and public support for "paternalism" schemes of socio-economic development is a characteristic feature of a contemporary Russia. It is peculiar that most respondents link improvements in environmental conditions mainly with strengthening the state control and tightening of environmental legislation, and only less than one forth of respondents believe that increase in public environmental awareness, real involvement of local communities in local action, building partnerships and a dialogue with those who are taking environmental decisions can be regarded as effective means for problem-solving.

Similarly to other regions of the Volga Basin, in the Lower Volga public opinion indicates that environmental problems compete with many other pressing problems and ecological destabilization and worsening of environmental conditions occupies only the third place within the public ratings, while the first two rankings belong to economic problems and threat of terrorist attacks. In general, the local community can be characterized by old stereotype perceptions, by passive approaches that in the context of bureaucratic impediments and delays in taking environmentally-oriented decisions leaves little room for optimism. Among the alarming signs is that stakeholders coordination and cooperation is poor and urgent actions need to be taken in this domain.

Business involvement in environmental problem solving

Currently, there are encouraging signs that business community is turning into an active player in environmental risk reduction. Examples from the Lower Volga and Northern parts of the Caspian Sea are becoming numerous. Particularly, industrial companies are starting to be actively involved in ecological monitoring. It is especially important due to recent serious shortages and problems in functioning of monitoring networks at the government level; since the end of the last decade some monitoring responsibilities are transferred to industrial companies, including monitoring of water resources, earth's

interior, ecological monitoring at continental shelf oil and gas developments <Pravila, 1998>.

Since 1997 LUKOIL company is involved in regular ecological monitoring in the Northern Caspian Sea where its oil and gas fields are located. Initially it was organized to compile data on baseline conditions in marine environment and biological resources at future development sites and to process information necessary for environmental impact assessments of oil and gas extraction. Currently, the scope of monitoring programmes had expanded to include evaluation of industrial impacts on marine ecology and effectiveness of protection measures undertaken. LUKOIL implements projects of bio-resources (fish stocks and mammals) monitoring, including regular observations of their quality and habitats that might be affected by oil and gas developments. Ornithological monitoring is being organized as well. First monitoring results (about three hundred hydrological, hydro-chemical, hydro-biological, toxicological and ihtiological parameters are being processed) indicated that current level of environmental pollution is lower than it used to be about 15-20 years ago. Extraction technologies used by LUKOIL allow this company to comply with the principle of zero-discharge.

Coordination schemes established by LUKOIL with the federal and territorial government organs responsible for ecological monitoring are of a particular interest. They include:

- Use of information resources archived by the government bodies about the state of the environment in the Norhtern parts of the Caspian Sea
- Transfer of data compiled by the company, including operational data, to the government organs involved in ecological monitoring and control;
- Transfer of data to archives of the Unified state fund on environmental situation;
- Involvement of interested government organizations in ecological monitoring and expeditions organized by LUKOIL;
- Regular submission of annual reports with monitoring results to territorial environmental organs.

According to some experts assessments one of the possible avenues for further development of interactions between business corporations and the government in the Caspian Sea is integration of monitoring efforts of these two stakeholder groups and enhancing cooperation between them.

Within corporate strategies of environmental and social responsibility of businesses which is actively pursued in Russia during recent years LUKOIL is undertaking a number of important steps. For example, they include efforts to enhance local public awareness and promotion of public participation in ecological policy formation and implementation. It supports initiatives of ecological competitions organized in schools and colleges of Astrakhan. It also takes part in construction of sturgeon breeding plant and melioration of its breeding grounds in the Delta, and in financing the programme for artificial sturgeon reproduction in Astrakhan oblast. Every year LUKOIL organizes public hearings on prospects of its activities in oil and gas development in the region, and specialists in environment protection and conservation are invited to take active part. For example, in 2004 the workshop with participation of oil companies (KNK, AGIP, Megatron, etc.) and NGOs of the Caspian region (from Russia, Kazahstan, Azerbaijan) was held to discuss environmental perspectives of marine oil/gas developments.

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3.1.5 Small Rivers of Russia: Environmental Protection, Rehabilitation and Development

SSEU, Russia

Introduction

Small rivers are water courses with their basins situated in one geographical zone, their hydrological mode is defined by local factors that can be specific and extrinsic for all rivers in this zone. The basin area of a small river usually does not exceed 2 thousand sq. km. Small rivers have considerable fluctuation in water flow: high during the snowmelt, showers and lasting rains and very low during the rest of the year.

In Russia, there are about 127 thousand small rivers with length ranging from 10 to 200 kilometers; their water resources account for about a half of the national total of river water resources. About 90% of rural population of the country lives in their basins. In Central and Southern parts of the European Russia, Urals and Western Siberia up to 50-70% of small rivers are used by industries and agriculture.

The role of small rivers is enormous because they:

- determine seasonal water inflow and ecological situation on big rivers;
- serve as a source of local water supply;
- widely used for melioration;
- serve as a source of fresh water for fish spawning areas;
- are important for local livelihoods, landscapes, hunting, economic uses, and are of a great esthetic value

Ecological situation on small rivers in Russia and in the Volga Basin

About 2600 small rivers flow into the Volga River. Particularly during the last decades they have been under serious human pressures, and damage to their ecosystems had been significant. It was a result not only of industrial impacts, but of agricultural development as well, including intensive irrigated farming, broader application of pesticides and mineral fertilizers, application of intensive technologies in crop production and animal breeding. Only about 15% of treated waste waters meet the existing standards. For example, increase in water use and pollution has led to deterioration of water quality in small rivers and to changes in their hydrological regime. In dry years small rivers lose up to 22% of water flow, while in the Central and Chernozem regions – up to 50%. In some areas small rivers dry up or disappear as a result of non-control water diversion. In general situation with small rivers in Russia in general, and in the Volga Basin in particular can be characterized as alarming.

Construction of the Volga-Kama cascade resulted in significant environmental changes in the Volga basin and along with the obvious socio-economical achievements (cheap electricity production with coverage of peak load in electricity systems, reservoirs for flood safety, regular water supply of cities, industry and agriculture, regulating water depths for navigation, etc.), led to catastrophic changes of the Volga macro ecosystem. It significantly affected the hydrological regimes of the small rivers. Today, water quality of the Volga basin reservoirs, including small rivers, is largely determined by high level of contamination by oil, phenols, pesticides, surface-active substances, salts of heavy metals, bacterial contamination.

Small rivers vulnerability to impacts of human economic pressures (deforestation, plowing, drainage, irrigation) is particularly high and they are characterized by low level of self-purification in comparison with larger water courses. Over the years many of them had considerably degraded. For instance, in Moscow region there are 4312 rivers and all of them, excluding the Moskva River, are small. But 150 years ago the number of small rivers was higher by about 25-30%, and the total number of springs in Moscow region was twice as higher as today.

Long ago, the great broadleaf woods along the small rivers banks used to regulate with their long roots the hydrological regime in soils, thus preventing from disastrous high spring floods and also saturated water-bearing layers during low-water periods. Today only toponomic names of villages and rivers as well as relics of oak stems found at the bottom of Trostenskoe lake remind about these great woods. In the 18th century oak rafts by means of the Moskva River towards Moscow had been a regular activity. P.P.Semenov-Tyan-Shansky (“Geographical-statistical vocabulary of Russian Empire”, 1865) wrote that tens of thousands of logs were rafted towards the Moskva river down the Istra, Maglusha, Ruza, Ozerna till the mid- 19th century. Today it’s possible to navigate along these rivers only by bidarka, but with a lot of difficulties. In the 19th century steamships went up to Borovsk, but nowadays the Protva River is not navigable. The small rivers had been the main transport ways up to the moment of railroad construction. They were connected by means of inter-basin canals making them the main trade routes and supported public mobility and life on the river banks. For instance, the canal built in 1826[11] between the Istra River and the Sestra River allowed stone blocks transportation from the Volga River banks to the construction cite of the Cathedral of Christ the Savior in Moscow.

The soil of small rivers’ flood-plains had been famous for agro-chemical properties and allowed reaping high harvests. It also used to be famous for meadows: the higher the yield of meadows, the richer became the soil. Besides fertile soils, among characteristics of small rivers flood-planes had been a favorable water regime; the waterlogged flood-lands were drained. It was forbidden to cut bushes along the

[11] Three stone locks, 8.5-kilometre canal and a dam were constructed that has increased the Sestra River’s level and formed an artificial lake Senezh of 7 sq.km.; the canal did not existed for a long time – it failed to resists the high competitiveness of Nikolaevskaya railroad, and in 1860 it was eventually abandoned.

riverbanks and to pasture on hay lands; pasturage was strictly regulated. Now, as a consequence of excessive grazing, the flood-lands of the majority of small rivers in the Moscow oblast are destroyed. There are practically no hay meadows left, and the rest are used as pastures, which are only half-covered with grass.

As a result of excessive deforestation in the upper part of the Moscow River the number of annual floods increased. During 150 years their number had increased twice by 1908, and it has been one of the reasons for building water reservoirs. The protective role of natural hydro-technical systems was transferred from forests to artificial hydro systems. Nowadays in Moscow region there is no more than 1% of deciduous forests left, more than a half of forest area is covered with birch and aspen woods of little value, which consume a huge amount of water from soil, and as a result small rivers and ground waters receive less water, especially in summer.

During the last 70 years “the life” of small rivers in Moscow region has become especially hard. In 1918-1923 all the forests in 30 versts-area around the capital had been destroyed: the supply of merchantable wood exceeded the 13-year plan. During the World War II Moscow region lost one half of all its forests. All these circumstances affected the situation with the small rivers. Exploitation of bogs before the war as well as after-war ameliorative works carried out according to the plan “Great Transformation of Nature” had great influence on them.

Sources of pollution and degradation of small rivers

The main sources of small rivers pollution are: 1) industrial and agricultural discharges; 2) non-point sources; 3) communal wastewaters; 4) polluted runoff from urbanized areas. Construction of wastewater treatment plants led to certain decline in water pollution of small rivers. However, increase from non-point sources within small-rivers’ catchments areas had been registered; first of all it is a runoff containing mineral fertilizer, toxic chemical and biogenic substances. The small-size shipping has become a new source of pollution.

Pollution from agriculture is becoming an increasingly important factor in small rivers degradation. Animal production units and farms which store manure along the river banks cause a great harm. For example, about 15 million tons of animal and poultry manure is annually heaped in Moscow region. The most threatening situation is registered along the banks of the Maglusha river (the right tributary of the Istra river); in its flood plains thousand tons of manure from Glebovsky poultry unit (village Glebovo, Istrinsky region) is stocked. In case of a high flood this situation may result in ecological catastrophe.

Small rivers of the Volga Basin face a number of common ecological problems. Many of them are related to inefficient land-use practices. Almost everywhere small rivers have lost the shelter forest belts as a result of deforestation, and soil degradation in their basins is rampant. As consequences of improper application of agro-machinery, especially on slopes, small rivers’ banks are destroyed. Without regulating the drainage and trees cutting their flood plains turn into arid areas. In some regions the previously constructed dam-barrages (regulators of drain) had been ruined, and this led to small rivers becoming shallower, drying up as a result of accelerated discharge of water.

Dumps that are formed along riverbanks and are not properly equipped with waste treatment techniques pollute small rivers: effluents during floods and rains flow directly to the rivers. For example, of a special worry is situation on garbage dump near the village Pavlovskoe on the flood-plains of the Istra River because its capacity is already exhausted and polluted waters flow directly into Istra.

Riverbeds of small rivers are also being mercilessly littered. Technical and household wastes that may not significantly impact the river-bed processes along the middle and big rivers, might be harmful for a small river. Even a middle-sized object, such as a lost tractor wheel, can destroy the river bend or cause a formation of an island. During the last decades the wastes from small agricultural machinery shops are accumulating

either along the banks, or in a water flow of small rivers. Unfortunately, there is no effective control over small rivers pollution and use of their flood-plains.

Small rivers bear great recreational loads that will grow constantly. Quite often tourists destroy bushes near riverbeds, trample down the herb layer, pollute the camping area with garbage. Riverbanks and rivers themselves with rapidly growing number of country houses, cottages, holiday camps turn as a rule into noisy “radio-equipped prospects”. Awareness raising campaigns are essential.

In Saratov oblast, numerous ecological and sanitary studies at the Right bank and Left bank rivers – the Volga tributaries - have revealed a number of general features that are characteristic for the small rivers in Middle and Lower Volga. Such rivers as Karabulachka, Tereshka, Nakhoika, Karaman present a mirror reflection of major ecological problems related to the Russian small rivers.

The following example can be indicative for the disturbing situation with small rivers conservation. In Saratov oblast sanitary purification is carried out only in 4 (0.2%) from 1800 villages by application. Regular purification is done only in 5-7% of all private households.

Concentration of animal and poultry units with primitive or no systems of manure disinfecting is a real ecological “slipknot” for small rivers, a strong factor for negative human pressures endangering health of the rural population. Assessment of surveys performed in small rivers of Saratov oblast indicates at serious shifts in their sanitary regime towards nitrogenous forms and bacterial pollution of such rivers as the B. Karaman, Tereshka, Nakhoika, Karabulak and many others[12]. Constant presence of phosphorous and organ chloride pesticides in all small rivers poses a direct threat to their sanitary regime and signifies the start of their degradation in case urgent response measures are not taken .

Due to comparatively small water supply and low flow rates the small rivers are characterized by poor self-purification capacity and by high vulnerability to human impacts on their watersheds. Regulation of small rivers with dams contributes to reducing their flow and to worsening the sanitary and hygienic water quality indices.

Small rivers conservation

Among existing ecological problems in Russia conservation and protection of small rivers many of which had been significantly degraded during the last decades is of a high priority. Particularly, rehabilitation of small rivers of the Volga Basin is of the utmost importance and urgency.

Small rivers of the Volga Basin should become a priority object of regard and of ecological rehabilitation on the basis of special government programmes. Some of them have been already developed during recent years. According to some experts there is also a need to develop an emergency government programme of the Russian small rivers recovery; its financing is to be mobilized through the "State fund for small rivers conservation". Major directions and regulatory regime for all these government programmes are to be based on the framework national law “RF Water Code” which is expected to be adopted soon.

There are also proposals to create a special network of small mobile units to provide regular monitoring of environmental situation on small rivers. Such express information is to be presented to responsible government bodies for operational control and decision-making aimed at problem-solving towards environmental rehabilitation of small rivers. Currently, inventory and certification of small rivers in Russia is underway and it is expected to generate unique information and data about current situation which is of a unique importance for decision-making regarding their rehabilitation.

[12] The water transparency in the Nakhoika and Karabulak river stations has decreased to 8-9 cm, BOD5 has increased up to 18 mg/l O_2, ammonia concentration reached 4 MPC.

Unfortunately, the level of coordination between stakeholders, and especially the role of local partnerships in small rivers rehabilitation is alarmingly weak. At the same time potential for public involvement and use of local knowledge in decision-making, for public participation in practical actions towards rehabilitation of degraded riversides of small rivers where they reside is enormous. But, it is underexploited. There is a growing understanding that urgent measures need to be taken to provide step-by-step approach and to increase public participation and awareness about small riversides restoration. Many successful examples and interesting lessons from public involvement in their local efforts for small rivers restoration are available not only from the EU small river basins, but from developing countries as well.

Among important current activities in small rivers protection and conservation is development of approaches to riverside water conservation zone (WCZ). WCZ as a territory bordering to small river water areas, should have special regime meeting the following requirements:

- prevent pollution by pesticides and mineral fertilizers applied outside WCZ;
- exclude use of any kind of chemicals;
- prevent flow of products from soil erosion into water bodies;
- avoid water quality deterioration as a result of recreational activities on small rivers.

The size of water conservation zones, forest protective belts along river banks, the regulations for land-use are defined by existing rules and norms adopted by the federal legislation and by regional/local authorities; it is coordinated with control organs and inspectorates. In case of small rivers the minimum width of water conservation zone is established depending on the average multi-year water's edge during summer period, but not smaller than the following: for rivers having the length up to 50 km – 100 m; up to 100 km – 200 m; above 100 km – 300 m.

There is a number of interesting proposals about development of the so-called "water conservation complex", that includes waterworks and engineering phyto-melioration for small rivers conservation[13].

Because among the most important threats to small rivers is their degradation due to negative impacts of agriculture, several approaches had been suggested of how to protect small rivers from polluting with excessive amounts of mineral fertilizers – nitrogen, phosphorus, potassium – that destroy the natural balance of water ecosystems the following set of measures should be applied:

- preserving scientifically grounded (for different kinds of soil) norms of watering and fertilizing;
- forbidding to use medium- and long-range sprinklers when watering with livestock sewage waters on WCZ;
- preferable usage of mineral fertilizers in the form of granules (urea, superphosphate, nitrophoska and others) which allows their optimal dozing and prevents from their wash-out into small rivers;
- safe storage of fertilizers on temporary platforms that prevents from washing out into water objects;

[13] According to this approach the surface part of water drainage is to be moved to the underground; planting forest belts along the riverside allows to intercept and disperse the surface run-off, to strengthen banks, to slow down erosion and toxic substances inflow, to extract biogenic matters from water bodies.

- timely fertilizing of unfrozen soil, avoiding application of fertilizers in winter, early spring, during floods (allows to decrease carrying-out of nitrogen by 20%, phosphorus and other elements by 10%).

In livestock breeding waterless means of mechanical disposal of manure from production rooms with its further application at farmlands as organic fertilizer are considered as priority direction of wastes utilization (liquid and solid manure).

During recent years the number of rural settlements along the small rivers and cottages (many of which are resided during summers) had increased dramatically. Consequently the human pressures on the riversides had augmented. Unfortunately this process in most cases is out of control from local authorities, and many ecological and sanitary norms are violated. It is of utmost importance to equip these small settlements with proper waste treatment facilities - to prevent non-treated discharges into small rivers, and to solve the problem of households' solid wastes disposal. Small (with capacity from 25 to1500 m^3/day) and local sewage treatment works (up to 25 m^3 / day) can be recommended as equipment for rural areas and cottages. Also, compost platforms and fields, bio-thermal cameras can be successfully used for treating solid wastes. Proposals for selection of local and small sewerage works are given in the table below.

Figure 27.: Proposals for choosing local and small sewerage works

Type of treatment works	Type of ground	Level of soil water occurrence (m)	Yearly average air temperature (°C)
Small treatment works			
Small fields of irrigation and filtration	sand, loam, light loam	1,25-1,5 m from surface of the land	0-15 °C
Biological ponds	hard loam , any clay	not less than 1 m from surface of the land	above 10 °C
Biofilters	any clay	not less than 1 m from basis of the building or hydro insulation	above 10 °C
Circulation oxidizers	-	-	above 7 °C
Local sewerage treatment works			
Filtering pits	sand, loam, light loam	not less than 1 m from pit bottom	0-10 °C
Fields of subsoil irrigations			above 10 °C
Sandy-gravel filters	heavy loam, loam, sand, limestone, clay	not less than 1 m from pallet of the drainage	0-15 °C
Filtering trenches	-	-	-
Biofilters with small capacity	heavy loam, clay	not less than 1 m from the basis	0-15 °C

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3.2 Institutional Frameworks in Practice:

Coordination, Sustainable Development and Environmental Risk Reduction in River Basins in the EU and Russia

3.2.1 EU Water Framework Directive

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

Nizhny Novgorod State University of Architecture and Civil Engineering, Russia

European Water Policy

Figure 28.: European Water Policy

Water protection is one of the priorities of the EU. European water-related environmental policy started its active formation in mid- 1970s with standards for surface water supply sources. In 1980 the targets for drinking water, fish waters, bathing waters and ground waters were set.

In 1988 the Community Water Policy Ministerial Seminar in Frankfurt highlighted the need for Community legislation covering ecological quality. This started the second phase of legislation development and resulted in adoption of the Urban Waste Water Treatment Directive (1991), Nitrates Directive (1991), Directive for Integrated Pollution and Prevention Control (1996) and the new Drinking Water Directive (1998).

Key Facts about the European Water Situation

- 20% of all surface water in the European Union is seriously endangered by pollution.
- Groundwaters supply around 65% of all Europe's drinking water.
- 60% of European cities overexploit their groundwater resources.
- 50% of wetlands have "endangered status" due to groundwater over-exploitation.
- The area of irrigated land in Southern Europe has increased by 20% since 1985.

(European Commission, 2002)

Continuous growth in demand for sufficient quantities of water of a good quality for all purposes resulted in a pressure for changing Community water policy. In 1995 an open consultation process involving all interested parties was initiated to develop the new European Water Policy. The outcome of the consultation process has been a consensus that common framework legislation was necessary to solve the problems of the current situation with water bodies and with water use practices.

The Directive 2000/60/EC of the European Parliament and of the Council (EU Water Framework Directive) was finally adopted 23 October 2000, and it entered into force after publishing in the Official Journal (OJ L 327) 22 December 2000.

Key Elements of WFD

Key elements of the legislation include:

- Management of the river basin is a common system of water management
- The Water Framework Directive requires a common mechanism for governing water based on river basins. The usual administrative boundaries will no longer apply. Initiatives taken forward for the Maas, Schelde and Rhine river basins have served as positive examples of the basin approach implementation.
- The protection of all waters – rivers, lakes, coastal waters and groundwaters.

The purpose of this Directive is to establish a framework for protection of inland surface waters, transitional waters, coastal waters and groundwater which:

- (a) prevents further deterioration and protects and enhances the status of aquatic ecosystems …;
- (b) promotes sustainable water use based on a long-term protection of available water resources;
- (c) aims at enhanced protection and improvement of the aquatic environment …;
- (d) ensures the progressive reduction of pollution of groundwater and prevents its further pollution…;
- (e) contributes to mitigating the effects of floods and droughts…

(WFD Article 1)

All these objectives are to be combined and integrated within each river basin.

Setting of ambitious objectives to ensure that all waters meet “good status” by 2015

‘Good surface water status’ means the status achieved by a surface water body when both its ecological status and its chemical status are at least ‘good’.

WFD Article 2 (18)

Ecological status as “an expression of the quality of the structure and functioning of aquatic ecosystems” is classified in the Annex V of the WFD in terms of the quality of the biological community, the hydrological characteristics and the chemical characteristics.

As no absolute standards for biological quality can be set, because of ecological variability, the controls are specified as allowing only a slight departure from the biological community which would be expected in conditions of minimal anthropogenic impact. The WFD provides a set of procedures for identifying that point for a given body of water, and establishing particular chemical or hydromorphological standards to achieve it.

Good surface water chemical status is defined in terms of complains with environmental quality standards established for chemical substances at European level (see Article 2(24), Annex IX and Article 16(7).

The WFD provides a mechanism for renewing standards and establishing new ones by means of selecting priority mechanism for hazardous chemicals.

This approach will ensure at least a minimum chemical quality, particularly in relation to very toxic substances, everywhere in the Community.

‘Good groundwater status’ means the status achieved by a groundwater body when both its quantitative status and its chemical status are at least ‘good’.

WFD Article 2 (20)

There is a presumption that groundwater should not be polluted at all. Therefore instead of setting chemical quality standards that gives the impression of an allowed level of pollution the WFD takes another approach comprising:

- prohibition of direct discharges to groundwater;
- requirement to monitor changes in chemical composition of ground water bodies (Article 8).

The Directive limits abstraction of groundwater to the quantity of the overall recharge not needed to support connected ecosystems (surface water bodies, terrestrial systems such as wetlands).

Thus the Directive provides a framework for integrated management of groundwater and surface water at the European level. This approach implies co-ordination of objectives to achieve good status for all waters by a deadline.

Requirement for cross-border cooperation between countries and all parties involved

The WFD requires for coordination of administrative arrangements within river basin districts.

'River basin district' means an area of land and sea, made up of one or more neighbouring river basins together with their associated groundwater and coastal waters, which is identified under Article 3(1) as the main unit for management of river basins.

WFD Article 2 (15)

The individual river basin districts should be identified by each Member State within its national territory. For the application of the rules of the Directive the Member States should ensure:

- Identification of the appropriate competent authority for the application of the rules of the Directive within each river basin district or the part of the international river basin district lying within its territory;
- that measures for achievement of the objectives established by the Directive are coordinated for a whole river basin district (for international river basin districts "the Member State concerned shall endeavour to establish appropriate coordination with the relevant non-Member States").

Coordination of measures and combined approach

The WFD aims at coordination of different measures taken at Community level to tackle particular pollution problems in order to meet the established objectives. Key examples of such measures are the Urban Waste Water Treatment Directive and the Nitrates Directive and the Integrated Pollution Prevention and Control Directive. The Directive requires ensuring an analysis of the state of water bodies and "a review of the impact of human activity on the status of surface waters and on groundwater" (Article 5(1) and Annexes II and III). The analysis and review are to be conducted so as to determine how far from the objectives each body of water is. At this point it is to be assessed if a full implementation of all existing legislation can comply with all the objectives of the WFD. In case it does not, it must be identified exactly why, and then additional measures are to be designed.

For many years the European water quality monitoring practice has been subdivided by two approaches:

- control of the sources of pollution through the application of technologies available;
- focusing on quality status of receiving environment.

Both approaches have potential shortcomings being applied alone. Thus, source controls do not take into account the cumulative toxic effects of contaminants that may have place where there are a number of different sources of pollution. The diffuse impacts can not be estimated. Quality standards applied to water bodies can underestimate the effects of particular substances on ecosystem due to lack of scientific knowledge regarding the "fate" of substances in the environment. This approach may also leads to gradual degradation of water body if its initial state was better than standard.

Therefore the WFD combines the approaches:

"With regard to pollution prevention and control, Community water policy should be based on a combined approach using control of pollution at source through the setting of emission limit values and of environmental quality standards".

WFD Paragraph 40, p. 4

The Directive requires that the best available techniques must be used for source-based control (Article 10 (1, 2) but it also set out a framework that comprises the development of a list of priority substances on the basis of risk (Article 16 (3, 4), Annex X) and then design of appropriate cost-effective measures to achieve "*the progressive reduction of discharges, emissions and losses of the substances concerned*" and "*cessation or phasing-out of discharges, emissions and losses of the substances"*.

According to the WFD the Member States should set their own standards for the pollutants not included in the priority list if these substances are important to a certain Member State. Selection of relevant substances is to be carried out for *each* river basin district (Article 2(15).

Ensuring active participation of all stakeholders, including NGOs and local communities in water management

"Member States shall encourage the active involvement of all interested parties in the implementation of this Directive, in particular in the production, review and updating of the river basin management plans."

WFD Article 14 (1)

In concrete terms this means that public participation is required when:

- river basin plans are established – the drawing up of a timetables and work programmes (in 2006);
- overview of important water management issues are published (in 2007);
- draft river basin management plans are presented to public (in 2008).

On request any interested party will have an access to background documents and information used for the development of the draft river basin management plan. At least half a year period will be given to comment in writing these documents.

The main reasons for the need to extend public participation:

- prioritization of measures to achieve the objectives in the river basin management plan requires balancing of interests of interested parties;
- transparency of procedures leads to a greater care of competent authorities and a greater care sense of responsibility among the citizens.

Requiring water pricing policies and ensuring polluter pay principle

According to the WFD the principle of recovery of costs for water services including environmental and resource costs related to damage or negative impact on the aquatic

environment is the basic economic instrument that can be used as part of a programme of measures.

It is stated that “Member States shall ensure by 2010:

- that water-pricing policies provide adequate incentives for users to use water resources efficiently, and thereby contribute to the environmental objectives of this Directive,
- adequate contribution of different water uses, disaggregated into at least industry, households and agriculture, to recovery of the costs of water services, based on economic analysis conducted according to Annex III and taking account of the polluter pays principle.” (WFD Article 9)

The economic analysis implies:

- making the relevant calculations for recovery of the costs of water services based on long term forecasts of supply and demand for water in the river basin district including estimation of relevant investments;
- estimation of the most cost-effective measures as regards to water uses to be included in the programme of measures.

International experience shows that careful water pricing acts as an incentive for the long-term sustainable use of water resources. For example, it was found that introducing metering systems brings immediate savings in water use of an estimated 10-25% of consumption.

The WFD requires development of water pricing systems that are sensitive to the physical, social, institutional and political setting in each location. At the same time it does not require a one set price for water across the European Union. Prices will differ from area to area depending on local factors but water charging decisions will be transparent across Europe (Article 14 (1, 2).

The WFD sets out clear deadlines for each of the requirements contained.

Figure 29.: WFD deadlines

Year	Issue	Reference
22 Dec. 2000	Directive entered into force	Art. 25
22 Dec. 2003	National and regional water laws, regulations and administrative provisions to be adapted to WFD	Art. 24
	Identification of River Basin Districts and Authorities, establishing appropriate co-operation in the river basins	Art. 3
22 June 2004	Commission provided with a list of competent authorities	Art. 3
22 Dec. 2004	Characterisation of river basin, review of the environmental impact of human activity and economic analysis of water use	Art. 5
	Establishment of register or registers of protected areas	Art. 6 and 7
22 Dec. 2005	Establishment of appropriate criteria for identifying significant and sustained upward trends in groundwater pollution and for the definition of starting points for trend reversals	Art. 17 (4, 5)
22 Dec. 2006	Monitoring network and programme have to be established and made operational	Art. 8, 21
	Timetable and work programmes for the production of river basin management plans for each river basin district to be published	Art. 14
	Establishment of environmental quality standards for all surface water affected by discharges of priority substance and control on principal sources of discharges	Art. 16
22 Dec. 2008	Draft river basin management plans presented to the public	Art. 13 Annex VII
22 Dec. 2009	Publishing first river basin management plans including programme of measures	Art. 13 & 11
2010	Introduce pricing policies	Art. 9
22 Dec. 2012	Make operational programmes of measures in each river basin district to deliver environmental objectives	Art. 11
	Establishment and/or implementation of control, limitation and other relevant measures related to point and diffuse sources of surface water pollution	Art. 10
	Interim progress reports to be prepared on progress in implementing planned programmes of measures	Art. 15
2015	Main environmental objectives to be met	Art. 4
	Plans to be reviewed and updated	Art. 13, 14, 15
2021	First management cycle ends	Art. 4 & 13
2027	Second management cycle ends, final deadline for meeting objectives	Art. 4 & 13

The EU Member States, Norway and the European Commission have jointly developed a common strategy for supporting the implementation of the Directive. The main aim of this strategy is to allow a coherent and harmonious implementation of this Directive.

One of the main short-term objectives of the strategy is the development of non-legally binding and practical Guidance Documents on various technical issues of the Directive.

The following guidance documents have been published:

- Guidance No 01 - Economics - WATECO
- Guidance No 02 - Identification of water bodies
- Guidance No 03 - Pressures and impacts
- Guidance No 04 - Heavily modified water bodies
- Guidance No 05 - Characterisation of coastal waters
- Guidance No 06 - Intercalibration

- Guidance No 07 - Monitoring
- Guidance No 08 - Public participation
- Guidance No 09 - GIS
- Guidance No 10 - References conditions inland waters
- Guidance No 11 - Planning Process
- Guidance No 12 - Wetlands
- Guidance No 13 - Classification of Ecological Status
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Some additional information can be found here.

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3.2.2 Russia: General Institutional Framework for Environmental Protection

EcoPolicy Research and Consulting, Russia

Introduction

In the nineties, Russia entered a new era of economic and political development that marked a transition to a market economy and democracy. This era brought with it a renewed commitment to sustainable development. Russia introduced new environmental policies, redefined its approaches to environmental management and designed new schemes for environmental risk reduction and enhancing human security.

During the last decade Russia was actively involved in reorganization and capacity building for implementation of its national and international environmental policies. Institutional innovations and wider participatory patterns, including increased role of business, locales, NGOs and public, diversification of interactions between the state and other stakeholder groups have been among the characteristics of new environmental policies formation.

However, while the process of radical political and economic transformation opened broader opportunities for environmental innovations and established new institutional context for ecological risk mitigation, the specifics of changes in economic, social and political systems, and instability of their major parameters during transition period in the nineties imposed a number of constraints on environmental institutions capacity building. Under such conditions, many of the newly introduced environmental instruments were deformed: they were producing non-standard outcomes, and their effectiveness appeared to be lower than predicted at the start of reforms. In some cases they resulted in failures in domestic and international implementation of new policies, and by the turn of the century the gap between progressive environmental policy goals and real effects of putting them into action increased considerably. Implementation of new instruments within general institutional frameworks deformed by corruption, weakness of government environmental institutions, lobbying by various interest groups, low accountability before the public and other negative factors manifested a variety of failures.

Recent changes in government administration, advances in federal relations and in formation of democratic society, positive results in combating shadow economy that flourished in the nineties, overcoming financial crisis and weakness of the state authority, shifts to rapid economic growth, establishing new patterns of interactions between government and business community as well as the new round of liberal reforms and strengthening institutional performance are considered as important prerequisites for increasing domestic capacity in Russia for environmental policy implementation.

Main Features in Environmental Policy Reorganization

From the beginning of the nineties Russia started to actively elaborate new environmental policy aimed at addressing environmental degradation which was inherited to a high extent from the Soviet period of extensive and unsustainable use of the environment. Many of national approaches to environmental problem solving had been reconfigured. In the aftermath of the Chernobyl disaster the environmental problems were of a high priority both at the public and political agendas. There was an important feature of the reforming national policies: formation of the new domestic

environmental management system was under a considerable impact from the West. A variety of institutional mechanisms and instruments applied in the market societies was transferred and adopted in Russia during the nineties. Major innovative elements of environmental policy reform include the following:

- Elaboration of the new environmental legislation and adoption in 1991 of the first framework environmental law in the history of Russia (replaced by its successor in 2002[14]), which was supplemented later by a set of special laws in particular spheres of environmental protection;
- Administrative reorganization in environmental management, including creation of a specialized government structure responsible for environment protection, and establishment of horizontal and vertical subsidiarity between organs;
- Decentralization of environmental management with transferring significant authority from the center to the regional level and locales;
- Introduction of economic mechanisms of environmental management, including polluter-pay principle and pollution charges, creation of environmental funds system across Russia;
- Introduction of environmental impact assessment for all kinds of economic activities and industrial projects;
- Declaring environmental *glasnost* and free access to ecological information;
- Promoting public awareness, education and involvement in environmental problem solving
- Support for international global environmental change agenda and enhancing participation in international environmental agreements.

Formation of a new institutional framework for environmental management can be regarded as a success of a new Russia. Despite some perceptions widely spread both in the West and inside the country that there is an urgent need for institutional capacity building in environmental sector, in fact, its basic elements are already in place and are embedded into ongoing market reforms. At the same time, assessment of policy implementation indicates that that still there are significant problems in its performance. Today, results of institutional reforms in the field look impressive, but their effects both on environmental problem solving and on changes of behavior of main domestic polluters seem to be more modest than expected at the start of reforms. A wide gap exists between design and action of environmental institutions.

During the nineties the environmental policy in Russia became increasingly dependent on specifics of economic and political developments. The so-called ‘situational factors’ of the transition period (for example, financial shortages, uncertainties in investment climate, under-reformed property rights, and low public control over environmental decision-making, unclear separation of functions between government institutions involved in environmental problem-solving, etc.) served as barriers and had extremely negative impacts on environmental performance. Their cumulative effect has led to serious deformations in application of new instruments and tools.

During transition period in the nineties, although the sustainable development principles had been officially advocated, the environmental priorities that have been at the top of

[14] Federal Law “On environmental protection”, N 7-FZ, 10 January 2002

national agenda at the start of reforms have receded before economic goals. Government programmes for social and economic development put a major emphasis on rapid economic growth, while environmental protection is not included, or at least is not clearly articulated as a government priority in a mid- or long-term perspective. Ecological concerns are not of a high ranking in the programmes of prominent politicians and political parties. Also, according to public polls, while the 'ecology' ranked high as a public concern at the start of reforms, it slipped down and appeared below other concerns as wages, prices, crime, education, social insecurity.

There is a widely spread perception in Russia that the 'luxury' of improvements in environment and increased environmental protection cannot be afforded as long as the economic situation has not improved. However, a number of recent initiatives both in Europe and in the several regions of Russia suggest that the coordination and reconciliation between economic and environmental priorities is feasible, and policy instruments are available that allow to achieve stable environmental and economic gains simultaneously.

Innovations in Institutional Framework for Environmental Management

Administrative reform and legislation

There are several important results and milestones in administrative reform of environmental management in Russia.

First, among the major success of the national environmental reform has been a thorough reorganization of institutional framework of environmental management with creation at the beginning of the nineties of a government environmental protection agency with the major control functions. It was a significant innovation as under the Soviet regime there was no specialized environmental organ and protection functions were dispersed among a couple of dozen sectoral ministries.

Second, during the nineties, and especially, by the turn of the century there has been a significant weakening of the state environmental authority in Russia. During this period, after several rounds of reorganization and withdrawal of some of its important control functions the environmental agency has been finally dismantled in 2000. On the one hand, such trend reflects the decline of environmental priorities at the national level along with shifts to a 'primitive' development model focusing on intensive economic growth heavily based on natural resource use. On the other hand, these developments had been under an impact of bureaucratic competition for control over access to natural assets, supplemented by strong lobbying of powerful monopoly industrial groups.

Third, in a course of recent administrative reforms quite cumbersome administrative structures for environmental protection had been established. Most of these functions are currently positioned within the RF Ministry for Natural Resources which is responsible for both the use of natural resources and control over the environment; however its primary focus is on control over the use of natural resources, especially of the earth interior, while environmental protection is regarded as a 'by-product' responsibility Although there have been attempts to separate resource-use and environmental protection through establishing of four agencies within this ministry15, and through division between them the responsibilities over the use and protection of environment, the task to institutionalize an effective government structure appeared to be quite difficult. Capacity of 'Rosprirodnadzor' (it shares some of control functions with 'Rostechnadzor', but there is no clear separation of responsibilities between them) is not adequate to the scales of existing domestic problems and challenges. As a result of recent reforms the institutional design for environmental protection produced a 'circle' - appearing in a situation similar to that at the start of national environmental reform.

Fourth, there is a growing understanding that ranking of environmental priorities at the national agenda should be elevated and they should be incorporated into socio-

[15] Federal Agency for Water Resources (FAWR), Federal Agency for Forestry ('Rosleshoz'), Federal Agency for Earth's Interior ('Rosnedra'), Federal Service for Control over Environmental Uses ('Rosprirodnadzor').

economic development strategies. Many proponents in the country are strongly supporting the idea of re-establishing of the national environmental protection agency with clearly defined control and enforcement authorities as the existing administrative system for environmental protection in general is not highly effective. Particularly, it does not provide for coordination between environmental and economic interests, as well as for coordination between various stakeholders. Existing problems in this segment of institutional design of environmental protection require urgent solutions and clear separation of functions between bureaucracies.

Decentralization of environmental management

With development of a real federalism in Russia during the last decade regions began to play an increasing role in environmental policy. This was a new phenomenon as during the Soviet regime their role was reduced to zero; the regions were almost unable to carry out their own environmental policies, and their environmental interests were subdued. As a result of reforms of domestic political system, regional authorities acquired broader competences in environmental protection within their territories. According to the new constitution the major issues of nature protection became to be a joint competence of the federation and federation subjects.

As a part of new environmental policy the federal level shifted to sharing its authority and to division of responsibilities with the regions and locales which is undertaken according to joint agreements between federation and its subjects which serve at the same time as coordination mechanisms for common efforts. According to the recent national law on environmental protection the scope of competences of regional environmental organs had been broadened and now they are able to effectively perform the environmental management within their territories. They are actively developing regional laws taking into account the geographical, social, economic specifics of their regions; however they should be in full compliance with existing national legislation. Broader control functions had been transferred as well from the federal to regional level: regional organs perform environmental control over the majority of polluters located within their regions (except those being under federal control).

The following major competences in environmental management are transferred to the territories:

- Defining major directions of regional environmental policies and introduction of regional programmes
- Participation in development of federal environmental policies and programmes
- Adoption of regional legislation, norms, standards and rules not ‘lower’ than federal ones
- Organisation of environmental monitoring within the territories
- Performance of ecological control
- Environmental impact assessment of economic activities
- Prosecution of ecological violations; bans on activities non-compliant with existing norms
- Management of regional natural reserves; compilation of regional Red Books
- Organisation and promotion of environmental education and public access to information

As a result of reform of environmental institutions and adjustments to recent administrative changes in the government the organs responsible for environmental management had been established in all regions of Russia. The structure of environmental administration in the regions reflects the current pattern of territorial

subsidiarity in the government. As the RF Ministry for Natural Resources with its four major administrations – i.e. federal services, is the major agency responsible for environmental management its vertical structure is indicative. Each of its four federal services has regional affiliations established in all seven federal districts (federal *okruigs*), with their respective territorial administrations in all federation subjects[16]. The same principles of vertical subsidiarity are also applied within the RF Ministry for Emergencies and other government agencies involved in environmental risk reduction.

Despite a number of coordination problems and some unresolved issues in vertical dissemination of competences between territorial environmental authorities the transfer of vast amount of environmental management functions from the federation to the regions is an important step forward and a significant innovation brought in by the environmental reform in Russia.

Institutional coordination and partnerships

Institutional coordination and partnerships between various stakeholders in environmental risk reduction is regarded as an important instrument of environmental governance. Similarly to many other countries coordination between stakeholders in large river basins is insufficiently developed in Russia. Insufficient coordination between stakeholders and their interests is a bottleneck in the problem-solving. Identifying tools and instruments for promoting coordination, cooperation and partnerships is among top items of the agenda for river basin management.

Despite various attempts to develop coordination within integrated river basin management in such large river basins as the Volga, recent practices indicated that together with success lessons a number of serious loopholes exist. Some of these problems can be summarized as follows (for more details, see CABRI D3 Report):

- integrated river basin management needs to be coordinated within broader socio-economic sustainability development schemes;
- coordination is a multilayered institutional problem; overlap of competences and responsibilities between institutions of various levels results in their poor performance and insufficient cooperation between them;
- exaggerated emphasis on the lack of financial resources to implement environmental initiatives is obvious, while the core of the problem is in identifying tools for their mobilization in the basin and coordination of allocation mechanisms;
- existing practices in the Volga Basin indicate at comparatively lower than in the EU local public participation in environmental decision-making, at poor use of rich traditional knowledge which does not allow to benefit from big potential of the Volga communities, and also at poor involvement of local public in initiatives towards river rehabilitation;
- recent important trend is the emerging new roles of business community in environmental problem solving in the Volga

[16] For example, in Privolzsk federal *okruig*, the Federal Service for Environmental Control ('Rosprirodnadzor') has its Chief Administration located in N.Novgorod, as well as Administrations in 15 federation subjects incorporated into this federal unit in the Volga basin. The Federal Agency for Water Resources of MNR (FAWR) has the similar vertical structure: today, among its 16 basin water management administrations (BWU) across Russia, four BWU are located in the Volga Basin, i.e. Verhne-Volzskoe, Nizhne-Volzskoe, Moskovsko-Volzskoe and Kamskoe with their respective territorial affiliations in federation subjects; its regional committees/departments for natural resources protection exist en each of 39 federation subjects in the Volga Basin.

Basin; diversified institutional frameworks, including incentive mechanisms and tools need to be installed by the government to further promote 'environmental responsibility' of businesses and reinforcement of its partnerships with other stakeholders in the basin.

According to CABRI experts assessments together with many interesting initiatives exercised within the Volga Revival Programme aimed at coordination between stakeholders and cooperation between partners there had been significant gaps between its ambitious and progressive goals, on the one hand, and their implementation in practice, on the other hand. At the same time, not only Volga Revival (closed in 2004), but many other important government environmental programs have been suspended in Russia during the last decade. Many of their failures were rooted in implementation stage. There is an opinion that the core reason for shortcomings is usually not in the programmes' design, but is associated with programme management and coordination mechanisms applied. Although the design of the Volga Revival programme was based on an integrated river basin management principle it did not produce the expected results of good governance. Vertical coordination between various levels also indicated at significant problems. It was noted that many shortcomings in performance of environmental programmes in Russia were also a result of economic and social problems emerged during the last decade in a course of the societal transition.

Loopholes in coordination mechanisms for resource allocations and insufficient funding for implementation of the Volga Revival programme also had been among the core issues. Shortages in financing when only one-tenth of the targeted funds had been transferred for its performance were indicated among causes for failures. Controversies in coordination of resource allocations between the federal level and regions in the Volga Basin were indicated. Often regions complained that the federal level was not meeting its financial obligations for transfer of funds, while representatives of the former noted that regions did not use funds apportioned according to initially envisaged priorities. Control of resource flows is important as well as transparency and accountability of all actors involved in implementation process. Combination with mobilization of internal resources with regional/local funds as well as capacities of various stakeholders is essential. Financing and resource allocation problems are common to many countries in Europe. In most cases resource allocations are accompanied by strong lobbying by various interest groups. Financial allocation appears to be not just a technical problem, but a political one.

Institutional coordination in environmental risk reduction in the Volga Basin turns into a complicated *multilayered institutional* problem, which is deeply rooted in the existing national institutional context. Current structure of government authority and dissemination/coordination of functions vertically and horizontally between bodies involved in environmental risks governance in the Volga Basin (including federal bodies with their territorial affiliations responsible for environmental risk management, administrations of federal districts, regional and local authorities) overlaps with application of river basin management (RBM) approaches. There is an expert opinion that the RBM approach in the Volga Basin (four Basin Water Management Administrations, BWU for the Volga Basin) 'contradicts' with the existing administrative system, and particularly with the system of federal districts (Volga, Central, South, North-West): in each federal district there are representatives responsible for environmental management coordination. It also overlaps with another 'layer' of administration, i.e. with the 39 federation subjects (republics, oblasts, *krais*, autonomous okruigs) in the Volga Basin with respective environmental and disaster risk reduction authorities responsible for management of respective segments of the Volga Basin. The lack of effective vertical coordination between local-regional-federal levels was indicated as negatively affecting the RBM application. Existing uncertainties in

division of responsibilities between authorities of various scales are perfect means to avoid responsibilities in practice.

Enhancing coordination with the *local public* and its involvement in decision-making and in actions for environmental amelioration is among the major policy concerns. Although increase in public awareness has been among the priority directions of environmental reforms initiated in Russia during the last decade, the public environmental consciousness is still weak, and ecology has been receding to the bottom in priorities of the local public agenda. Insufficient recognition of environmental NGOs both by the public and private sector is characteristic. Environmental NGOs in Russia are much less developed than in the EU; however, a number of them are effective in the Volga Basin. Mobilization of the public and problem pressure groups is regarded as a promising tool for the nearest future. New patterns of interactions between environmental NGOs and authorities are being developed, and particularly important is a dialogue and consultations between the authorities and local public. For example, although Dront is sometimes regarded as oppositional to the government (due to its campaigns in civil rights protection), it develops cooperation with authorities, and particularly with the regional environmental agency in performing a number of joint projects. As interaction and cooperation with the civil society is still far from desired - constructive actions are needed in this area. Among burning problems is establishing the accountability and transparency of local authorities before the local public in environmental problem solving.

New RF Water Code

The new RF Water Code has been recently approved by the Russian parliament, and it is to enter into force 1 January 2007. It is a *framework* national law regulating the use and protection of water resources and interactions of stakeholders in this process. Along with other federal laws (for example, on environmental protection, on the Earth's interior, the land code) and corresponding legislation of the federation subjects it establishes a comprehensive system of domestic water legislation. Although the Water Code is based to a high extent on existing national water legislation[17], it contains some innovations, including water property rights, vertical subsidiarity in water governance and division of competences between various levels of authority, institutional coordination based on basin approaches, new principles defining access to water, strict regulations and control in water resources conservation and protection, including adoption of water conservation zones, and others.

Basin Management. Water Code adopts a *basin approach* to water governance in Russia. This principle envisages regulation and management of water use, access to water resources and their protection within particular water basins, i.e. *basin okruig* (art. 28) which serves as a unit for water governance within the basin area. According to the Code twenty basin okruigs are established in Russia, including four of them for the Volga basin (the Upper-Volga, the Oka, the Kama, the Lower Volga). This structure is based on combination of two principles, i.e. current administrative division in Russia and on geographical and hydrological regimes. Similarly to the EU Framework Water Directive (FWD) water management approaches the Code envisages integrity in conservation of all water resources, including those of river basins, related ground waters and seas. However, it does not advance as far as the latter in application of coordination principles between administrative units situated in the same river basin: FWD suggests that "management of a river basin is a single system of water management" and no administrative boundaries are applied any longer in that respect. Detailed coordination principles based on basin approach are to be developed in Russia within a process of domestic implementation of the national framework law.

[17] It replaces the current RF Water Code adopted in 1995

Basin Councils. Institutional *coordination* in protection and use of water resources is realized through the *basin councils* (art.29) which are responsible for recommending effective water governance options within basin okruigs. Recommendations of basin councils are taken into account in development of integrated water management schemes[18] for each river basin by respective federal authorities. Councils' design and scope of activities are to be determined by the RF government in a course of Water Code implementation. Among innovative approaches is broad participation of major stakeholders in the basin councils. They are to include representatives of both government institutions, i.e. responsible executive federal organs, authorities of federation subjects, local municipalities, and also representatives of water-users, public organizations and indigenous people. The very recent CABRI discussion indicated that challenging opportunities are now opened for selecting the most effective institutional designs for the system of water governance in the Volga based on basin council approach.

Vertical Coordination. The Water Code clearly defines vertical structure and coordination principles between various levels of authorities within water governance. Particularly, it establishes subsidiarity between three levels of state authorities - federation, federation subjects and municipalities. It also adopts division of competences and responsibilities between various levels in regulation of access to water and water protection. Major new principles of vertical subsidiarity include:

- Significant part of competences/responsibilities (with accompanying funds, i.e. subventions from the federal budget) is transferred from the federal level to federation subjects
- New competences in regulation of water use and water protection are transferred to municipalities
- Strict control over execution of water management functions and over use of financial resources allocated for these purposes is established
- Possibility to withdraw the competences in case of non-compliance with established provisions

The Water Code contains significant innovation relating to *property rights* over water resources and water bodies. While according to the previous RF Water Code, 1995 water had been declared as the property of the state, the new WC treats water resources in the *federal property*. Certain types of water bodies can be in a property right[19] of a federation subject and a municipality, of a private person and juridical entity. The major water bodies, i.e. rivers, lakes, artificial reservoirs, canals are in the federal property. Property of a federation subject and municipality, physical or juridical person can be executed only towards a pond or a career located within the limits of land site being in their property.

Civil Society. Among basic principles of the Water Code is establishing the legal framework for participation of civil society, of particular individuals and non-governmental organizations in decision-making relating to water property rights and responsibilities in protection and conservation of water resources. According to art.3 (6) the public can take part in preparation of decisions implementation of which might affect water resources, their use and conservation. In their turn, the state authorities, municipalities, water-users must promote public participation and select concrete forms

[18] Integrated water basin management schemes (art. 33) define allowable limits of human pressures, water quality indicators, water balance, inventory of water use (water consumption and discharges) and water protection activities, flood risk reduction indicators and level of funding; these integrated schemes are obligatory for all state authorities and municipalities.

[19] In a course of WC discussion in the Federal Council three amendments related to property rights had been introduced y the opponents of privatisation: 1) privatisation of water bodies used as a source of drinking water supply and for economic purposes is prohibited; 2) privatization of water bodies currently being in a municipal property is prohibited; 3) transfer of property rights over water bodies from one owner to another is limited.

and mechanisms according to existing national legislation. The Code also guarantees equal access of physical and juridical persons to the right of water-use as well as property rights over water objects in cases envisaged by this code; each individual has an access right to common water resources. It also establishes the principle of *glasnost* and free access of civil society to any information on water-use (except data defined for limited dissemination by the government). Traditional water uses by indigenous people of the North, Siberia and the Far East is envisaged. The Water Code items on civil society participation in decision-making and in practical actions are of a special importance for Russia: according to CABRI assessments this is a weak segment of 'good water governance' and a great deal of challenges are associated with the process of WC implementation.

Stakeholders. The Water Code defines major types of stakeholders taking part in water relations: they include federation, federation subjects, local municipalities, physical and juridical persons. Further desegregation into sectoral groups of actors based on concrete type water uses is suggested by this national law. Particular regulatory provisions are defined for each group along with general principles of water use and water protection which are to be applied by all stakeholders. It identifies the following groups of users of water for the purposes of:

- Drinking water supply and water supply for economic activities
- Sewage water discharges
- Artificial reservoirs maintenance and use
- Energy production
- Transport
- Timber floating
- Health and medical care
- Recreation
- Fisheries and hunting
- Mineral exploitation
- Fire safety
- Traditional uses by indigenous people

Agreements. Regulatory approaches to coordination of water access and water protection and to interactions between the state and water-users are based on new institutional design suggested by the WC. It envisages a shift from current national regulatory practice based on combination of licensing and agreements towards a relaxation of administrative and excessive bureaucratic procedures. Now *agreements* on water use are combined with permits, or the so-called *decisions* on the use of a water body, while for the certain types of water uses a free access is established. The latter case refers to environmental protection, navigation, fire protection, fisheries and reproduction of bio-resources, research and monitoring, water use for private rural households, leisure, and to some others. Agreements between executive authorities and water-users are established (for the period up to 20 years) in case of (a) water extraction, (b) use of surface of water bodies, including for recreation, and (c) energy production. Special fees for water-use are fixed by the agreements and they differ across water basins. Decisions are allocated by the federal government or executive authorities and municipalities for a broader variety of water-uses, including water discharges, security issues, hydro-technical facilities and networks, transport infrastructure, mining, timber floatation, agricultural melioration and some others.

Water Quality Norms. The Water Code defines rules for development of norms of allowable impacts on water bodies and respective water quality indicators for water bodies. Norms of allowable impacts are based on maximum allowable concentrations of chemicals, nuclear substances, micro-organisms and other water quality indices. These norms are adopted according to existing regulatory regimes defined by the government. Water quality norms are developed by responsible federal executive authorities for each

water basin taking into account its natural and geographical conditions, as well as specific features of water-uses within the basin. For water bodies used for drinking water supply special sanitary and protection zones are established. Use of ground waters is regulated by a special national legislation on the Earth Interior. A system of special regulations and bans are established for sewage water discharges, dumping and discharges of harmful substances. The mentioned above integrated schemes of water use and water protection for particular basins establish water quality indicators for the basin or its sub-basins, limits for sewage discharges and water consumption. They also specify allowable levels of human pressures along with the list of protection and conservation measures and measures to reduce the risk of floods (art.33).

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3.2.3 Public Participation in Decision-Making through Public Hearings: Coastal Urban Land-Use in the Volga Basin

International Ocean Institute, Malta

Introduction

Among existing loopholes in environmental management in Russia in general is weak public participation in decision-making and in environmental actions. To a high extent it is a “heritage” of Soviet political system, and in a course of democratisation in Russia various efforts are undertaken to promote public participation. The below case of opening wider access for local public to decision-making within coastal urban land-use practices is an interesting example of new approaches to the issue.

Land use for construction and reconstruction in the Volga Basin needs transparent and clear procedures. Usually local communities in the Russian cities are trying to prevent construction and reconstruction activity on sites adjacent to residential areas. (*The*

Institute for Urban Economics, 2004). They appeal to local authorities, press on companies and workers protesting against construction in both legal and illegal ways. Sometimes they destroy buildings and facilities.

To find positive and constructive solution one should link the protest with:

- The procedure of legal land use and land rights;
- The procedure of official ordering of land for new construction and reconstruction.

Land zoning is a key point of the issue. New Russian Land Code makes possible application of legal zoning in conflict solving. Advantages of legal zoning in comparison with traditional Russian practice could be analyzed on the basis of good European and Russian practices.

Local authorities are to solve conflicts through using procedure of public participation in decision making. This procedure is based on the RF Land Code, 2001 and RF City-planning Code, 2004. Environmental aspects of legal zoning in the RF are based on both federal and regional laws (*A. Ivanov, 2004*).

Several common features of possible conflicts can be identified:

- Public usually is not informed properly about land use possibilities, designed projects and guaranties.
- Development of city areas is not a matter of traditional public discussion because land rights are not fixed for cities in transition. Even property right depends on city planning and of surveying of lands and property rights. No criterions exist on participation of public in land use decision making.
- Russian practice is based on attempt to spread public participation from discussion of basic city act to project design discussion.
- Administration still is involved in decision making without clear simple formalized criterions. Broad field of their activity makes rights of land owners uncertain and weak. Private business activity is not protected by local legal acts.
- In Russia local administration prepares public hearing and make decision on their basis. They have possibilities to influence on the process of discussion and decision making.

Approaches based on the new Land Code

International experience was used in Russia to solve some land use problems on the basis of legal zoning. Legal zoning is a standard land use planning procedure in Europe and in the USA. RF Land Code and RF Construction Code also apply some instruments used by the European practice. But in Russia this experience was not used prior to the 21 century. Currently, advanced cities and municipalities are developing local land use regulations.

General approach to solve existing problems on the basis of legal zoning includes:

- Development of procedures of public involvement in decision making are based on:
  - Master plot plan
  - Regulations of site development adopted by local authorities including relevant maps
- Land Survey documents.

- The most effective way of solving land use conflicts in RF is development of land surveys. Potential disagreements and issues are to be solved before investment phase. During discussion of pre- investment documents regulations on gaps and height of building is to be fixed. Property rights are to be established as well.
- Public hearings on site development documents are held in Russia by the Commission for land use and site development. Commission includes representatives of local authorities, NGOs and landowners.

Key rights

Right to participate in discussions

Right to discuss planning and design decisions belongs to:

- residents of the developing area;
- mortgage owners, users and leaser of the developing area;
- residents and mortgage owners of adjacent area;
- other persons, involved in area development.

Subject of discussion

Subject of public discussions among other issues include an assessment of correspondence between design documents and 1) regulations included in Settlement rules on Civil construction; 2) Technical regulations; 3) Minimal official quotas for public lands.

Procedures

After finalizing of design preparation the investor has to appeal to the Commission Chairman asking for a public discussion of the project. The latter in 7 days informs the residents and stakeholders via mass media about planned public discussion, including the information about project area, date, time and place of discussion, phone number for references, place, date and time for project investigation by stakeholders..

Owners and land users of cites to be bought out or reserved for municipal and state purposes should be informed personally about designated public discussions.

Data of Public Hearing is to be assigned not earlier than in 10 days after publication and not later than two month after appeal was made.

Public hearing could be assigned at any day except official holidays. Time of weekday public hearing should not be assigned before 18-00 local time.

Commission provides an opportunity to stakeholders to study the project design. During the hearing commission held minutes. Commission prepares recommendations to mayor of the city. Mayor of the city not later than in two weeks makes a decision on:

- Adoption of design documents
- Correction based on Commission's recommendations
- Rejection of design documents

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3.2.4 Long-Distance Freight Transport on Inland Waterways

Rupprecht Consult, Germany

Introduction

CABRI-Volga aims to achieve or at least initiate improvements in various aspects of environmental risk management in Russia's Volga Basin, namely river and environmental rehabilitation, human security and vulnerability, natural resources and their sustainable use, connecting goods and people, as well as institutional coordination and cooperation. The project is following an integrative approach. It emphasizes the interdependencies of the above mentioned thematic areas.

All of the five CABRI-Volga thematic areas are very complex in their nature. It would be overambitious and unrealistic to trying to tackle all aspects of the thematic areas within the scope of CABRI-Volga. Therefore, one of the methodological conclusions of the First CABRI-Volga Expert Group Meeting was to focus on key topics within each of the thematic areas. For example, it was suggested to concentrate discussions in the thematic area "Connecting Goods and People" during the remainder of the project on "long-distance freight transport on inland waterways" as well as on "sustainable urban transport solutions"[20] In general, transport is regarded as one of the key stakeholders in sustainable development of large river basins.

This chapter concentrates on "long-distance freight transport on inland waterways". This topic emphasizes very well the complexity which exists also between the different thematic areas. Transport (and traffic) has negative effects on the environment. Air pollution, noise, contributions to global warming as well as the deterioration of the living conditions in urban areas can be mentioned here. On the other hand, we enjoy the goods that are delivered to us, sometimes from far-away places[21] and we value the importance of goods transport to the successes of businesses and industry.

A key to managing the trade-off situation between freight transport and protecting the environment is to find more efficient and more sustainable solutions to (long-distance) freight transport. It is widely recognised that different transport modes (road, rail, inland water ways) need to work together and that this working together – or intermodality – needs to become fostered as a standard transport (and mobility) principle. In order to do, the present paper describes some (institutional, legal, technical) framework conditions from the EU as well as from the Russian Federation emphasising, where applicable, intermodality. Furthermore, it offers good and practices for long-distance intermodal freight transport from the EU which involve inland waterways and may be transferred to the Volga and other Russian rivers.

[20] Other possible topics such as "leisure mobility" and "clean water- and land-transport" which are also mentioned in the project workplan will only indirectly influence discussions in future CABRI-Volga meetings.

[21] Plus, we enjoy our personal mobility as well – intermodal passenger transport will be the focus of a parallel paper.

Framework for long-distance and intermodal freight transport in the EU and the RF

Inland waterway transport is considered ecological safe and reliable.[22] However, at the same time, it is not sufficiently flexible and quick in the delivery of the goods and therefore not competitive enough against road and railway transport. Framework conditions for freight transport with emphasis on intermodality are described below.

Current situation and trends

Over the last fifteen years, inland waterways transport in terms of freight volume has seen slight increases in the countries of the EU. In the countries with the highest volume of inland waterways traffic, i.e. in Germany, the Netherlands and France, the increase was 16%. This is considerably less than the 41% increase in total transport volume.

The modal share of inland waterway transport in Germany, the Netherlands and France is now at 14.4%, down from 17.6% fifteen years ago. For the entire EU, inland waterway transport accounts for about 4% of all transport.

In Russia, less than 4% (i.e. similar to the entire EU), of the total transport volume is carried out by inland waterway transport. However, there has been a sharp decrease in inland waterway transport since 1988 when over 580 million tons were transported on the World's largest inland waterway network[23] In the middle of the 1990's only about 100 million tons were transported on the Russian rivers and canals. Increases have been realised beginning in 1999. In 2004, already 136 million tons of goods were transported on Russia's inland waterways. The forecasts envisage a further increase in transport volume to up to 230 million tons in 2010.

There are plans to further develop the so-called Pan-European transport corridor No. 2 which connects Berlin, Warsaw, Minsk, Moscow, and Nizhny Novgrod. Furthermore, the development of the transport water corridor Volga-Don-Danube which would connect the large inland water arteries of Rhine, Main, Danube, Dnieper, Don, and Volga is currently promoted (for example by the Association of Ports and Shipowners of River Transport in the Russian Federation.

In the countries of the EU, it can be observed that intermodality in freight and passenger transport is becoming the norm. While intermodal connections become more routine and also quicker. However, the majority of intermodal connections concern the inland waterways in the hinterland of seaports. The greater traffic volume is observed in national and European inland transport, and as long as dynamic growth in the inland waterways sector is limited mainly to seaport-hinterland traffic, the necessary and possible contribution of the inland waterways to relieving congestion on the roads will not materialise.

Logistics firms appear not convinced that, overall, the more complicated transport chain involving the inland waterways is more advantageous than the more organisationally straightforward door-to-door transport by road. So far, strategies seem to merely concentrate on the environmental advantages of inland waterway transport. However, very few inland waterway players have developed a constructive marketing approach pointing out the specific tangible advantages of intermodal transport chains (cost, reliability, possibility of saving on storage).

Technical considerations

In the 1960's and 1970's the Unified Deep Water System (UDWS) was created in the European part of the Russian federation. The UDWS allowed for a connection between five Regional Seas through the construction of the White Sea-Baltic Canal, the Volga-

[22] In the EU, a detailed environmental audit of the transport function as part of the eco-management and audit scheme (EMAS) or ISO EN 14001 is often used to identify the detailed environmental performance of different modes of transport. In the majority of circumstances a switch away from road transport will deliver immediate improvements.

[23] Russia possesses some 101.8 thousand km navigable inland waterways.

Baltic Canal, the Volga-Don canal and the Moscow Canal. In parallel, a unique transport fleet of mixed sea-river vessels was build up allowing these vessels to operate both on inland waterways and seas. These sea-river vessels have the advantage that they can operate in sea areas when in the winter months inland waterways are frozen for 3-8 months. However, at the present time, most of the sea-river vessels are in urgent need to be renovated.

There have been disputes with other countries which had doubts in the safety and reliability of the sea-river vessels. These disputes have been resolved, but the lack of international regulations concerning that type of vessels had been a constraint for the further development of river-sea shipping.

In this context, it needs to mentioned that the 2001 Pan-European Conference of Minister of Transport (Rotterdam) adopted recommendations called to support and promote the development of inland water transport in Europe and to unify the rules governing this sector.

Inland waterway vessels in general provide for floating storage. They support manufacturing industry's policy of promoting just-in-time delivery and minimal storage. However, there is also a need to establish an information and reference system on cargo flows and organizing continued monitoring of the cargo base available. In addition, for intermodality to spread to national and European inland transport, containers must be easier to stack and better suited to pallets, and the cross-border networking of national waterway systems must be improved.

Legal and institutional considerations

Internationalisation and multimodality call for more coordination and cooperation along the transport chain. In April 2005, The Council of Ministers of the European Conference of Ministers of Transport and the United Nations Economic Commission for Europe (UNECE) called for "Model Action Plan for the Development of Intermodal Transport at the Pan-European Level".

"Model Action Plan for the Development of Intermodal Transport at the Pan-European Level

The "Model" of an inter-governmental Action Plan given below represents good practice endorsed by the member Governments of the European Conference of Ministers of Transport (ECMT) and the United Nations Economic Commission for Europe (UNECE). This "Model" provides an agreed basis to cooperate with each other on a bilateral or multilateral basis along specific intermodal transport lines with a view to improving the competitiveness of international intermodal transport services along these lines.

The purpose of such an Action Plan is to set a political signal of Governmental commitment and support for the development of intermodal transport and to provide a framework for the conclusion of Partnership Agreements among the various public and private parties involved to collaborate towards efficient and competitive intermodal transport services on specific intermodal transport lines.

In Russia, the State control over inland water transport has a three-layer system. The Ministry of Transport develops the State Policy and lays down the legislative basis in their field, whereas the Federal Agency for Merchant Marine and Inland Shipping, together with its local branches, provide for navigational conditions, govern State Property and render State services in river transport. The Federal Service for Supervision in the Field of Transport performs overall control and supervision. (*Kormyshov, 2005*)

According to the President of the Association of Ports and Shipowners of River Transport[24] (*Zaitsev, 2005*), the governmental Decree, "On measures of State support for renewal of fleets of merchant marine and river vessels" providing for a partial payment of interests from the budget has not brought the results expected due mainly to cumbersome bureaucratic procedures for obtaining the above taxation relief. Some expectations by the shipping industry are now based on an envisaged adoption by the Duma of a Federal Law "On the second international register of ships" aimed at encouraging the return of vessels under the Russian flag.

Bottlenecks to overcome

Investigations carried out on some river ports under the TACIS programme have shown the need for reconstruction of the ports into logistics centres with comprehensive development of container terminals.

In Russia, inland waterways transport faces obstacles such as seasonal nature of vessel operation and bottlenecks in the network of inland waterways. For example, the traffic capacity of the Volga-Baltic and the Volga-Don waterways is exhausted. The waiting time for passing is unacceptable due to the excessive number of vessels. Another example is the Gorodtsky Lock due to its low depth causes long waiting/processing times. There is even a danger that the UDWS would be divided into a Northern and a Southern part. The Russian government is considering the construction of a new low-height step to prevent this from happening.

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[24] Association of Ports and Shipowners of Water Transport unites 190 ports and shipping companies in Russia.

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3.3 Human and Environmental Security:

Vulnerability Assessment and Flood Risk Reduction in the EU and in Russia

3.3.1 Recent Developments in Flood Risks Management

INWEB, Greece

Introduction: Topics and definitions

The topic of human and environmental security and vulnerability in large river basins focuses on reducing risks to people and the environment from hydrological extremes, such as floods and droughts. Additional topics should also be considered, such as technological accidents associated with excess of water quantity and water quality deterioration, for example flooding from potential accidents at dams and power plants, failures at sewage systems and accidental discharges of wastewater with resulting water pollution in the river (*Ganoulis 1994*).

Nowadays in all these situations, the concept of human security may be extended from its traditional meaning of local and worldwide civil and military security of citizens to also embrace the idea that every human being should be able to benefit from sustainable socio-economic development. From amongst different natural resources, water has been recognised as the key environmental resource for social security, economic growth and prosperity. Human security can therefore be seen to be related to environmental preservation (water, ecosystems and biodiversity) and to socio-economic stability and sustainable development (*Renaud, 2005*). The concept of sustainable development and integrated management of water resources was first mentioned in Stockholm in 1972, during the United Nations World Conference, and then at the Rio summit in 1992 with Agenda 21.

The term vulnerability as applied to humans, ecosystems or any environmental system, denotes the susceptibility of the system to risk. It may be considered as a performance index of the system, indicating the possible degree of a system's damage or the severity of consequences, due to an incident such as a flood or a drought.

Floods are essentially natural hazards that occur regularly, but become disasters when they interact with the human society. In most cases *natural factors* are the main cause of catastrophic floods. However, *anthropogenic factors*, such as human occupation of flood plains, extensive urbanisation, basin-wide land use changes and structural measures to mitigate floods (flood levees and walls, cutting of the river meanders, river training) have modified the natural characteristics of extreme floods (*Rossi et al. (eds.)*, *1994; Gardiner et al. (eds.), 1995*). Recent catastrophic floods both in Europe and the USA (*Elbe River, 2002; Danube River, 1999, Rhine River, 1995; Mississippi River 2001)* have shown that human activities and traditional river engineering works may result in an increase in the frequency of small and medium floods and, most importantly, in negative economic consequences such as loss of property, destruction of livelihoods and loss of human life. Possible climate change might increase both the intensity and the frequency of catastrophic floods.

As a matter of fact, human activities in river basins have aggravated flood risk by:

- Aggravating the flood events. Urbanisation, agriculture and water drainage have diminished the retention capacity of the vegetation, soil and ground, amplifying flood scales. We may also assert that structural flood defenses have often induced a raise in flood level and speed.
- Aggravating the flood consequences. Growing human presence in flood plains gives flood a higher destruction potential for a given magnitude.

In the past, the most widely spread solution to flood risk exposure was river containment, with the construction of levees, embankments, canals and dams. The global efficiency of a flood defence system based only on structural devices has proven to be unsatisfactory. Beyond the residual risk of failure, and increasing downstream water level, these protection devices deeply interfere with the natural river flow and do not allow alluvial deposits in the flood plains. Moreover, they can only effectively offer protection against minor or medium events, as all defence constructions are designed to provide protection for a given flood level or return period; yet people living in the flood plain area have a false sense of security, as they are unaware that defences may be ineffective against a rare or extreme event. Because of the illusion that there is no flood risk, communities are not willing to adopt all necessary preventive measures and by not doing so they increase their vulnerability and also their losses in case of flooding.

In the past years, many initiatives have been taken to improve flood mitigation in river basins; new paradigms and new tools have been developed within the frame of integrated river basin management (*Kotov and Nikitina, 1998, 2001; Ganoulis, 2003, 2004, 2005).*

Integrated flood risk management

Integrated Flood Risk Management (IFRM) can mean very different things according to different approaches, such as engineering, social or institutional. It is recommended that integrated flood risk management be defined as a multi-dimensional and multi-disciplinary activity, which takes into account technical, institutional, economic, social and environmental aspects of flood assessment, prevention, mitigation and control, as well as promoting a more holistic view on the whole spectrum of human security and vulnerability to floods.

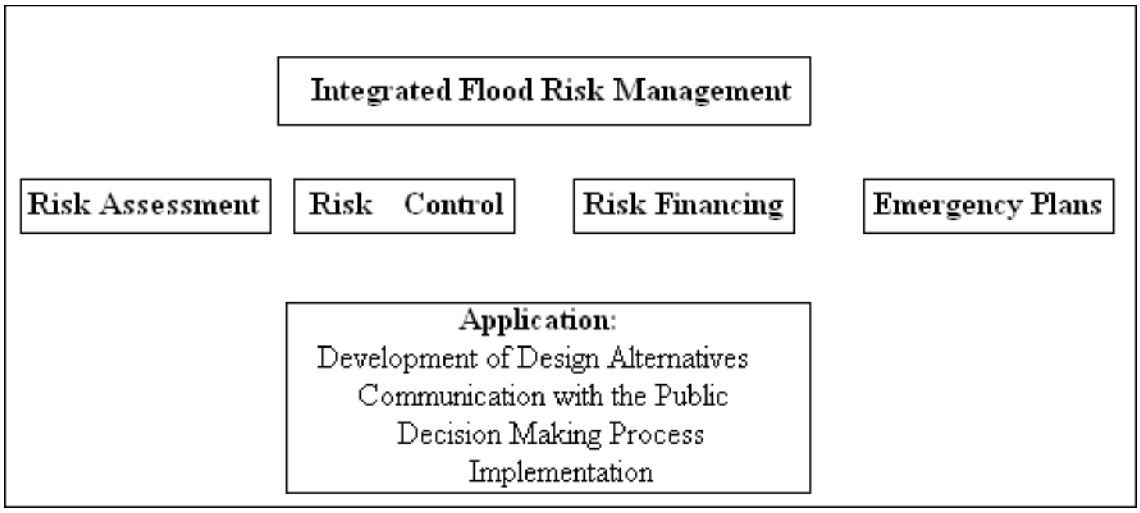
In IFRM, the river basin is considered as a whole, with downstream\upstream solidarity. As part of integrated water management, IFRM contributes to rationalising the use of river basin capacities and unifies the social, economical, hydrological and environmental points of view in a global perspective. These considerations imply good communication and coordination between all the actors in the river basin, perfect transparency and access to information for all stakeholders, as well as public participation. The main aims of IFRM are:

- protection of human settlements and interests: reduction of flood damages to “acceptable” levels ensure the sustainability of human settlements and activities
- restoration of fluvial law, ecosystems and water cycle: beside the pure environmental aspect, natural mechanisms and cycles rehabilitation is also a guarantee of sustainability for society . They contribute to flood mitigation and to providing healthy drinking water;
- promotion of risk culture: so that all necessary preventive measures can be taken people should be made to realise that the idea of total protection is a myth. This is a switch from dominating the risk to living with it;
- promotion of basin wide solidarity and actions: mobilisation of all stakeholders (water agencies, municipalities, inhabitants, companies) and impact studies for any initiatives;
- preparation for extreme events partly due to climate change: a very long term validity of IFRM actions is expected, even if climate change amplifies flood (and drought) scales.

In order to meet these objectives a framework for IFRM (Fig. 31) was proposed by Plate and Merz, 2001 among others. In contrast to other natural hazards like earthquakes, in

IFRM it is possible to independently control both *the load* that is represented by the flood and *the resistance* of the endangered assets.

Figure 30.: Main elements of integrated flood risk management.



The four main elements shown in this figure and described by Nachtnebel, 1993, are:

- Risk assessment that includes the analysis of various failure modes together with the evaluation of the consequences in case of a given failure.
- Risk control includes 'risk prevention' and 'risk mitigation' measures. The first term refers to actions, which may either be structural or non-structural, to reduce the failure probability by reducing the flood peak. Non-structural measures may include preservation of inundation areas, increase of infiltration rates by appropriate land use, and establishing river corridors by buying land along the river banks. The second term refers to actions, which again may be structural or non-structural, to reduce the vulnerability of the system by imposing regulations on land use and land development, by enforcing technical regulations for any construction works in flood plains.
- Risk financing involves two aspects including risk acceptance by the people concerned, or transferal of risk to a broader community, either by agreements within different groups of society or by any insurance mechanism.
- Emergency plans. Due to the fact that some uncertainty will always remains in the system about the time and magnitude of an extreme event, precautionary measures (emergency measures) have to be developed so as to be prepared in case of emergency. These include the development of information systems, warning systems in case of emergency, evacuation plans and response actions to efficiently avoid secondary losses.

The elements described above are elaborated at the expert level but the involvement of the public concerned is necessary for the measures to be successfully implemented and for them to work in case of emergency. Public involvement in the selection of alternative strategies and in the communication of risk is vital.

There are two different approaches to reducing the risk of floods and to alleviating their consequences (Fig.32): The first is to consider the flood as a random natural disaster and to only respond on an ad hoc basis through emergency programmes. The alternative, favored by the CABRI-Volga project, is to recognize that floods are recurring

phenomena and to adopt a proactive and strategic approach, combining mitigation measures with emergency response and rehabilitation, and incorporating disaster risk reduction into sustainable development strategies. In this way, the hazard is "internalised" and vulnerabilities can be reduced and coping capacities enhanced.

Figure 31.: Alternative actions for flood control

FLOOD CONTROL ALTERNATIVES	**Alleviation** **- Flood Mitigation** **- Vulnerability Reduction**	*Emergency*
Prevention	***Structural Measures*** (levees, diversions, channel regulation,) **Non-structural Activities** (open space preservation, planning, zoning, ….) **Property protection** (insurance, relocation, acquisition, …) **Public Information** (Flood maps, outreach, ….)	Emergency plans Warnings
Coping Post-Factum	Technical assistance Rehabilitation	Evacuation Technical assistance Rehabilitation

Furthermore, the following additional recommendations came out of CABRI 1st EG Meeting in Nozhny Novgorod, 2005:

- Flood management and protection of people and property should take into account the fact that major cities are often better protected than small settlements and rural communities. Therefore special emphasis should be given to the problems and vulnerabilities of rural communities and small and medium sized cities.
- Awareness rising is an important issue, particularly for those people living in areas prone to floods.
- It is recommended that structural and non-structural measures be integrated and considered at the same time, instead of one after the other.
- A key element for integrated river basin management and the reduction of potential damages and losses is the strategy based on allocating more space to the river bed through effective national and local planning
- Floods cannot be avoided, however human intervention, especially land use patterns and engineering works, is a key factor affecting the impact and magnitude of medium and small scale flood events. Specific attention should be given to deforestation, change of hydromorphological situation of a river, the conversion of open space in a settlement area and the construction of infrastructures, such as roads and highways.
- Furthermore, it was mentioned that a recent study in Switzerland came to the conclusion that increasing investments in systems of flood protection leads to higher economic losses after catastrophic floods. There will always be a risk element when catastrophic floods occur, and a wrong perception of this kind of risk and reliability may create

problems, especially for people living in flood plains, who are highly exposed to such hazardous events.

- Increasing extreme weather events and rapid temperature changes resulting from climate change, which could result in snow melting, can be dangerous for dams, dykes and engineering structures used for flood control. The possibility of dam failure cannot be neglected.
- Improved monitoring of flood events, impacts and vulnerabilities is important to increase human security. It has been shown that poor people generally face a higher risk of mortality and relatively higher economic losses from hazards of nature.
- The quality of data and reconstruction of the monitoring systems should be focused on, particularly after their decline in the 90s due to the general economic crisis in the post-communist countries.
- Additionally, building codes, guidelines for flood proofing constructions* and structural measures (e.g. giant levees) are important elements that can increase human security in terms of natural hazards, such as floods. *(Brilly, M. 2001; *Engineering Principles and Practices for Refitting Flood Prone Residential Buildings, FEMA US, 1995)*
- In the Volga basin it is also important to focus on droughts, water scarcity and technical hazards.

Institutional considerations

A commission for emergency management should exist for the institutional setting of emergency response and disaster risk reduction. This commission should encompass local and regional authorities of the respective river basin. It should be linked to important agencies and enterprises. Together with engineers and emergency response agencies, the commission should prepare a planning document every year for the spring floods in the region. A special safety brigade should be responsible for rescue operations and emergency management during the event. The emergency plan for flooding should focus on aspects of evacuation, potential coping capacities and places of evacuation. Specific plans should also be formulated regarding the dissemination of information to radio and TV stations. (The above recommendations resulted from existing experience in the Volga River basin.)

- Information exchange and an in-depth cooperation between institutions as well as the active participation of the public in developing strategies for integrated flood management are essential.
- A lack of appropriate cooperation is also a major problem of human security, such as the lack of information sharing between national states along the same transboundary river.
- One should also consider the different steps in the disaster phase (prevention and coping) and level of regulation, such as normal regulation and emergency regulation. This means one should ask who is able to act appropriately in the different phases of disasters and at what level? The coordination of different functions and institutions is essential. One has to acknowledge the fact that institutional solutions cannot be generalised.

- Moreover, it is recommended that the historical dimension for risk assessment related to certain processes or events be included, for example in the Netherlands water management and water related risks have been key issues for several decades.
- A serious problem regarding human security and vulnerability reduction is also false alarms that delay services giving out early warning information. No or late warnings may cause fatalities and increase damage. Local information services (radio, newspapers or TV) with which people are familiar are the best methods of spreading flood warning information.
- A crucial issue is the organisation and promotion of quick and effective response. The case of New Orleans highlighted the need to also take into account the multi-ethnic aspect of different social groups and their social structure[25]. This leads to the recommendation that cultural, social and linguistic aspects should be paid more attention.

Public participation and socio-economic issues

- Public participation is especially well developed in the Netherlands, where the way of life and the perception of risk have also been addressed in integrated flood risk and flood vulnerability reduction.
- Besides the early warning and the awareness of people, the general status of maintenance of infrastructures is also a key element of vulnerability. Therefore one can conclude that disasters are often a combination of different causes leading to disaster.
- More attention has to be given to secondary damage and secondary effects. Often only the primary effects and damages are considered.
- Holistic and integrative risk and vulnerability assessment also has to be based on ex-ante and ex-post analysis. The limitation of the analysis of past events is not adequate for the estimation of present and future vulnerabilities. In this context, scenario-based assessment strategies are important.

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[25] Elderly people are very vulnerable (e.g. casualties in old people's homes in New Orleans) and the protection of societies where elderly citizens are in the majority presents a challenge (see experience from Slovenian – US research mission).

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3.3.2 Vulnerability Assessment in Europe and Russia

United Nations University Institute for Environment and Human Security, Germany

Nizhny Novgorod State University of Architecture and Civil Engineering, Russia

Introduction

Throughout the world, individuals and communities are more and more exposed to environmental hazards with dramatic and long-lasting effects particularly in developing countries. The last decades have seen an increasing trend in natural disasters and their impacts on human beings and infrastructure (MunichRe). Statistics aside, we have seen in the last two years only some major disasters that have spread devastation in the affected areas: in 2004 mud-floods killed some 3,000 people in Haiti and just after Christmas, approximately 250,000 people were killed by a tsunami that affected Southeast and South Asia as well as Eastern Africa; in 2005 hurricanes have killed scores of people in the Caribbean, the United States of America, and Central America and an earthquake killed over 80,000 people (and counting) in Pakistan. These are just a few examples and many more people have lost their lives or livelihoods throughout the world because of natural and man-made hazards.

Many interrelated factors combine to explain these trends. First of all some hydro-climatic events may have become more frequent and more intense with global climate change. This is a scenario that is highlighted by the Intergovernmental Panel on Climate Change (*IPCC, 2001*). Second, social, demographic, cultural and economic factors have meant that communities have either become more exposed, more vulnerable, or both to these hazards, thus being more at risk.

Risk towards any given hazard can be determined by the probability of the hazard to become an actual event and by the vulnerability of the exposed communities (*Birkmann, 2006; DKKV, 2004; Kron, 2002*). Vulnerability of individuals or communities is thus an important component of disaster risk analysis and any disaster risk reduction needs take into account the results of vulnerability analysis which can pinpoint areas of intervention to reduce risks. However, as important as the concept is, vulnerability assessment is not a simple task and is complicated by the fact that vulnerability is defined differently depending on the background and interests of scientists and professionals. Thywissen (2006) reported some 30 different definitions in a comprehensive review of disaster terminology. Vulnerability assessment methodologies are nevertheless being developed and assessments are being carried throughout the world. This section presents and compares some case studies from Germany and the Russian Federation for floods.

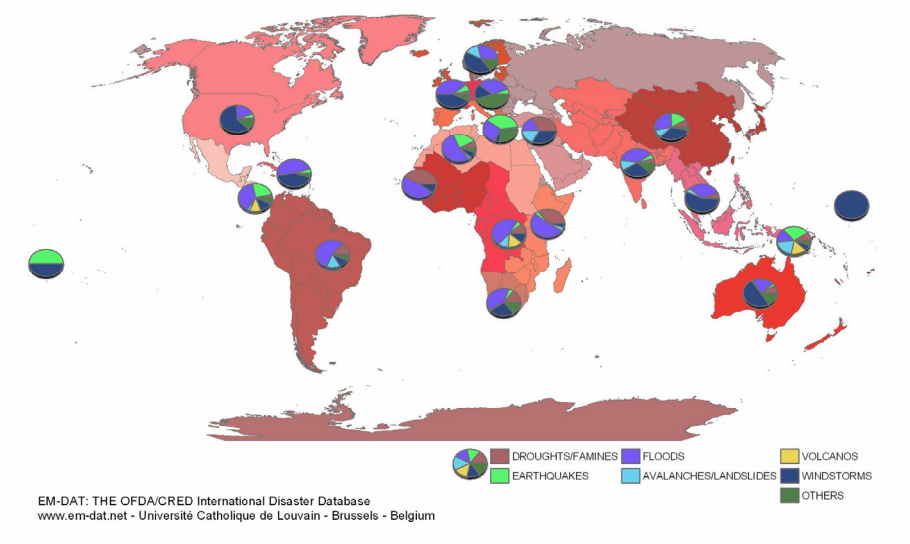
Vulnerability assessment for floods: Europe

The year 2005 has seen many extensive and deadly floods throughout Europe, particularly in Central Europe where, according to the CRED[26], 63 people were killed in Romania, 7 in Bulgaria, 6 in Switzerland, and 4 in Austria and many others were affected in various countries. One of the biggest flood events in Germany was the 2002 Elbe flood which was initiated by long-lasting rain falling on previously saturated soils with huge economic losses and hardship to affected communities. Finally, between 1992 and 2002, Italy was twice in the top-10 costliest floods worldwide with economic losses of $9.3 billion in 1994 and $8.5 billion in 2000 *(Kron, 2002)*.

More generally, between 1998 and 2002, Europe suffered approximately 100 damaging floods (representing some 43% of all disasters) affecting 1.5% of the population, causing 700 fatalities, half a million displaced people and €25 billion in insured economic losses (EEA, 2003). Together with windstorms, floods represent the hazard with most frequency in Europe (Figure 1) but there are typically more flood disasters in the Russian Federation than in the rest of Europe.

[26] EM-DAT: The OFDA/CRED International Disaster Database - www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium

Figure 32.: Disaster type proportions by United Nations sub-regions: 1974-2003[1]



Areas most affected by repeated flooding were north-west Romania, south-eastern France, central and southern Germany, northern Italy and eastern England (*EEA, 2003)*. From 1992 to 2001, 30,004 *communes* of France were affected by hazards from which 24,269 where specifically affected by floods (*Coutellier, 2002).* Climate change is a major driver behind some of the observed floods *(EEA, 2005)* but climate change alone can not explain these trends as, for example, studies have shown that no increase in the occurrence of intense rainfall events was noticed for south-eastern France in the past 45 years *(Trocherie et al., 2004)* even though this region is affected by floods on a regular basis. A more important change in some basins is land-use change, such as the conversion of forest in pastures, or pastures to agricultural land, and increase in urbanisation *(Trocherie et al., 2004; EEA, 2003)*. When combined with continuous encroachment of people in floodplains (floodplains have always been attractive locations for people – see e.g. *Affeltranger et al., 2005*), this results in more people and infrastructure being exposed to floods.

Figure 33.: Number of occurrences of flood disaster by country: 1974-2003[1]

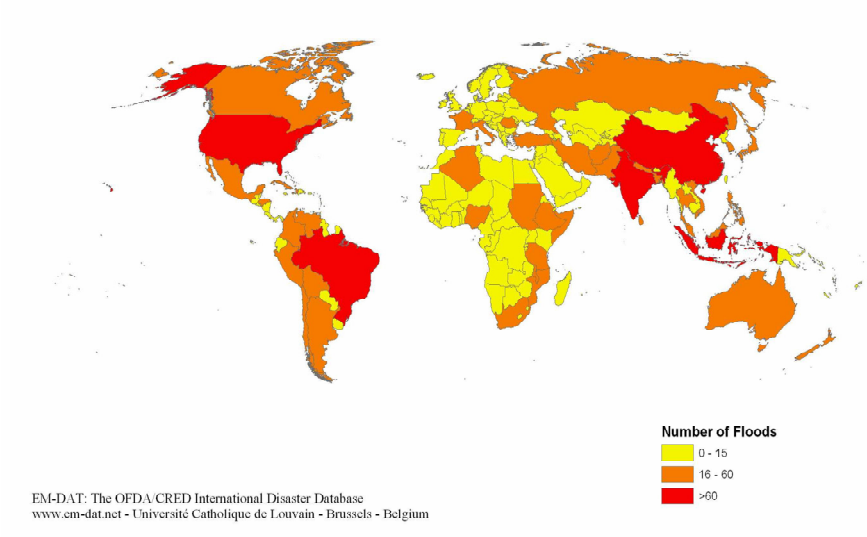
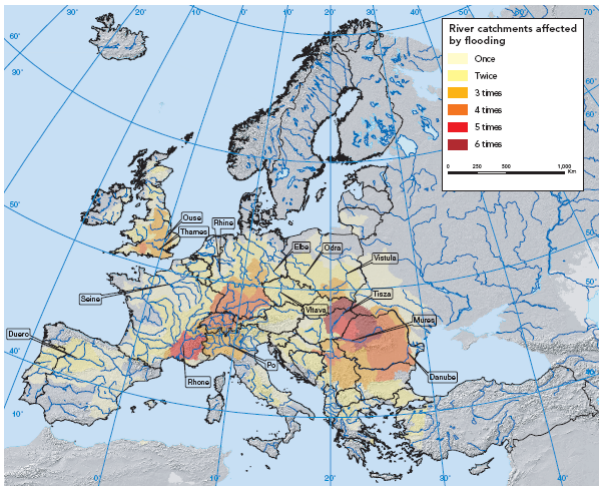


Figure 34.: Recurrence of flood events between 1998-2002 (ETC/TE, 2003 quoted in EEA, 2003)



The importance of vulnerability assessment

Vulnerability assessment serves multiple purposes. Firstly by allowing the identification of vulnerable elements within a community, the assessment allows for determination of policies that can be put in place in order to alleviate this vulnerability (whether it is social, economic or environmental components of vulnerability). The activation of these actuation systems (see Birkmann, 2006) is one aspect of disaster risk reduction. Secondly, vulnerability assessment also contributes to the determination of appropriate protection activities allowing for more effective protection, planning procedures and allocation of resources, in other words, to be better prepared for emergency situations. Such an approach is used in Germany since the 2002 Elbe flood (Queste, 2006).

Some methodological considerations

In addition to the issue of definition mentioned in the introduction, the problem of scale comes into play. The elements to consider for vulnerability assessment will indeed vary whether we are looking at the national, sub-national or local scale. Several risk indicators have been developed for flood hazards, one of the best known one being the Disaster Risk Index - DRI (UNDP, 2004). This index operates at the national scale and is the ratio of casualties due to floods over number of individuals exposed to floods in a given year, and was calibrated with data from 1980-2000. Unfortunately, the DRI does not provide very useful information for policy-makers who would be interested in acting to reduce flood risk and vulnerability as conditions vary greatly from on region to the next within a single country. In addition, one event can change the DRI drastically and a country that was ranked among the “safest” can suddenly find itself as one of the most vulnerable after a new event.

It is in part for this reason that UNU-EHS has decided to carry our vulnerability analysis at the local scale. This has its own drawbacks, such as the lack of social and economic statistics and the need for detailed data collection, but on the other hand the assessment is highly relevant for the communities surveyed and allows for precise policies to be put in place to alleviate identified vulnerabilities.

Examples from Germany

Flood risk assessment and mitigation is tackled both at the Federal level (Ministry for the Environment, Nature Conservation and Nuclear Safety) and at the State level in Germany (*DKKV, 2004)*. Policies are the resort of the Federal level while flood reduction and prevention is tackled by the States. Because of this setup, different approaches are used by different States and communication between States is not always optimal *(DKKV, 2004)*.

Federal level

At the Federal level recommendations to alleviate vulnerability are centered on exposure reduction, preparedness, and insurance. Examples of recommendations are *(DKKV, 2004)*:

Technical solutions such as:

- Permanent or mobile barriers like those used in the city of Cologne;
- Improved building stability (heavy structures, anchoring);
- Raise or seal buildings to avoid flood water entry; and
- Limited utilisation of ground floor space to avoid excessive losses.

Preparedness:

- Flood warnings;
- Information dissemination;
- Disaster protection exercises; and
- Reaction chains;

Insurance

When it comes to insurance, the German insurance industry has established a rating system that defines exposure in the country. Insurance is then available depending in which zone the elements to be insured are located (Zone I – small exposure; Zone II moderate exposure; and Zone III high exposure) with insurance typically available for elements in Zones I and II and no insurance (or only under restrictive conditions) for elements in Zone III *(Kron, 2002)*.The zonation is carried out using GIS and hydrological and hydraulic modelling.

State level

The German state of Mecklenburg-Western Pomerania uses the following vulnerability indicators (*Queste, 2006*): number of inhabitants per community; number of potentially affected farm animals; and number of potentially affected critical sites.

Vulnerability is a recognised feature of risk assessment but it is seldom adequately accounted for when carrying out risk assessment. For example, Messner and Meyer (2005) provide an elaborate scheme of indicators for vulnerability assessment but when describing flood damage analysis methodologies, only indicators for economic impacts are used. Messner and Meyer (2005) acknowledge the limitations of using such indicators only of ignoring socio-economic approaches.

Examples from Russia

Risk assessment and management

Disaster and emergency situation management In the Russian Federation includes risk assessment which serves as a background for development and implementation of measures to improve preparedness. Vulnerability is the element of risk assessment defined as an ability of the object to lose its natural or prescribed functionality due to external negative impacts.

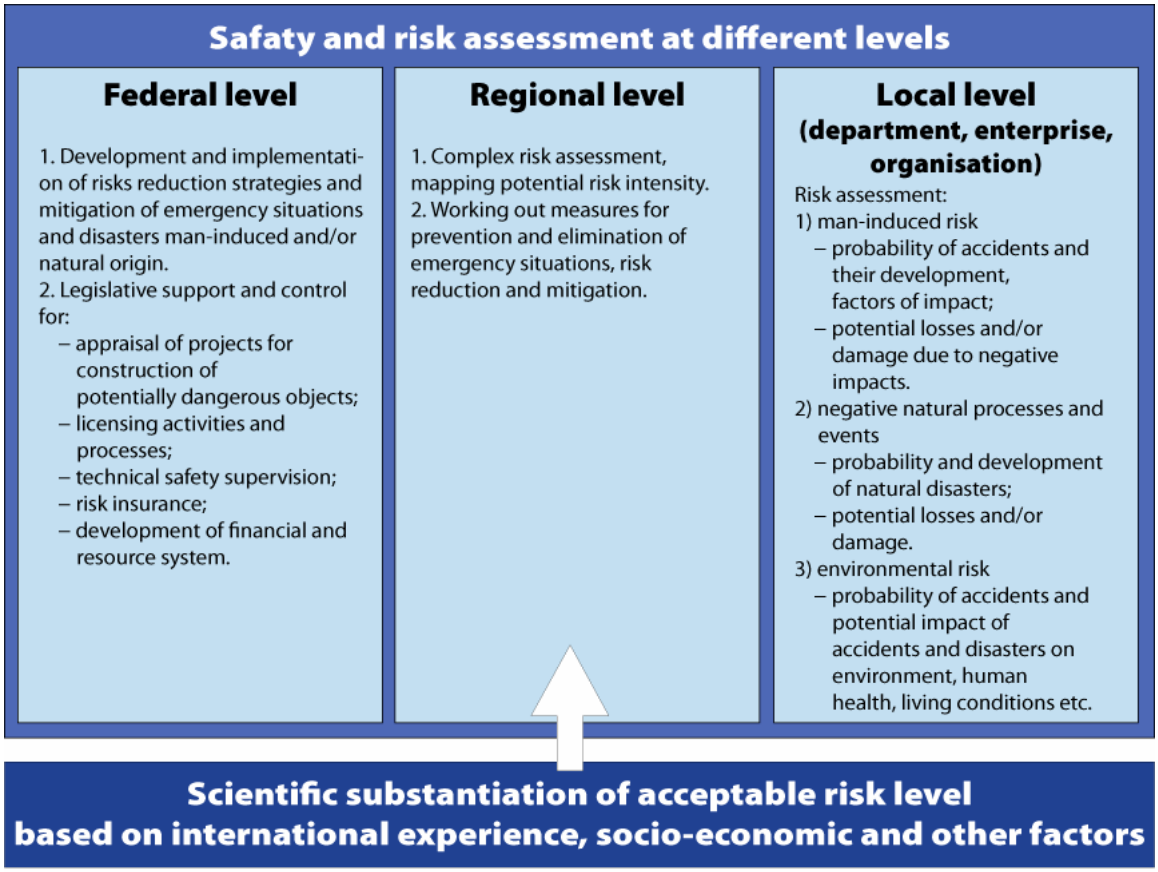
Safety and risk management in Russia is a hierarchical system which includes Federal, Regional and Local levels to develop and implement risk management strategies:

- Prevention of man-induced emergency situations and catastrophes and providing stable function of dangerous technological processes.

- Localization of emergency situations (catastrophes) in order to avoid unfavourable environmental situation development.
- Prevention and mitigation of man-induced and environmental factors which impact on population and natural complexes.

These strategies aim at achieving acceptable safety level in order to ensure high living standards of people *(Vladimirov, V., 2000).*

Figure 35.: Safety and risk assessment

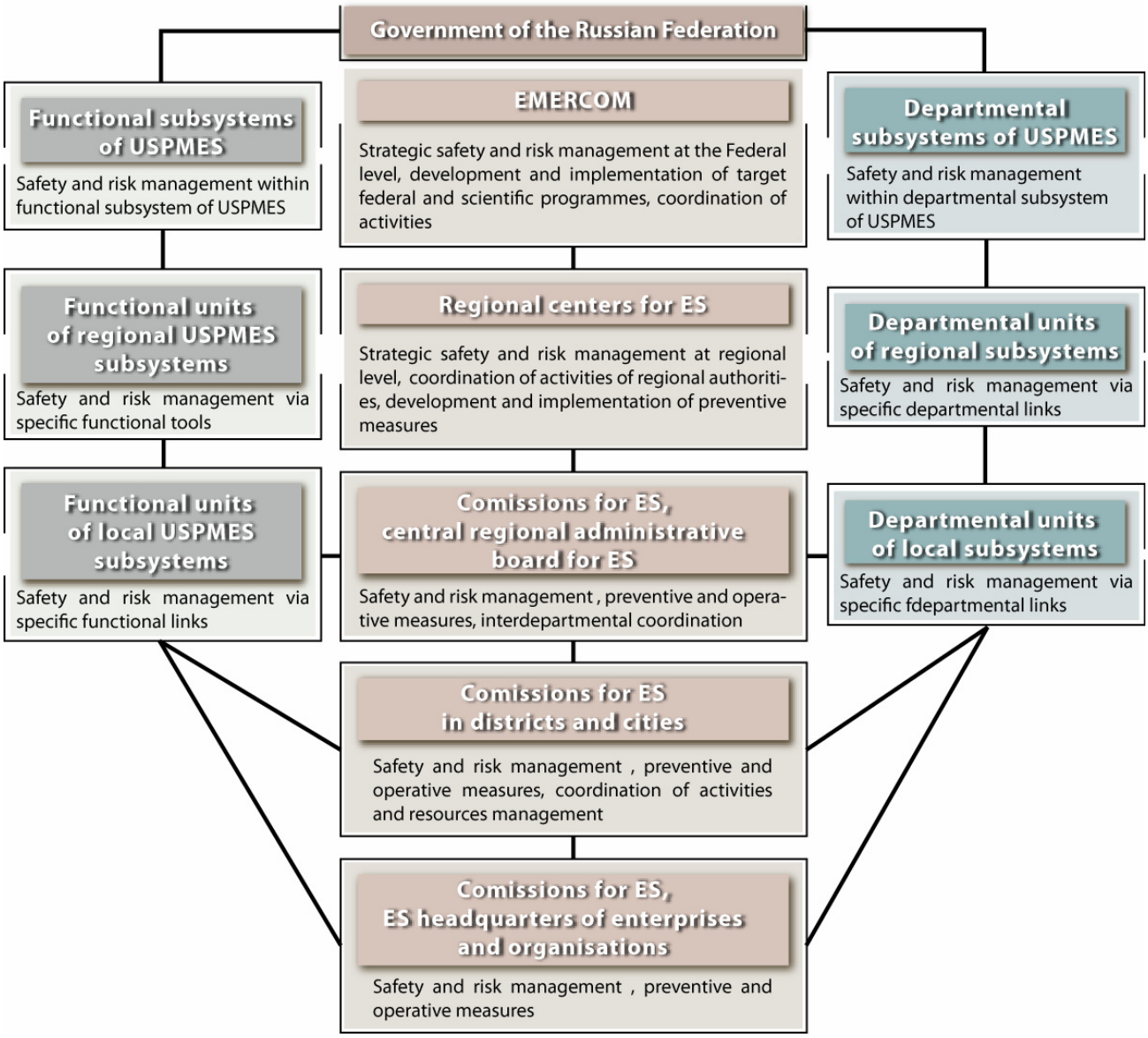


Functional units of USPMES include ministries, departments and authorities of the RF which have specific functions related to environmental monitoring, management of emergency situation, health care system including:

- RosHydromet (Federal Service of RF for Hydrometeorology and Environmental Monitoring)
  - hydrometeorological observations
  - monitoring air, water quality
- Ministry of Natural Resources (MNR)
  - natural resources management
  - licensing of activities related to use of natural resources
  - observation of dangerous geological processes
- Federal System of Seismological Observations (combines MNR, Russian Academy of Sciences, Department of Defense etc.)
  - seismological observations
  - earthquake forecast

- Federal Ministry for Civil Defence, Emergencies and Natural Disasters Mitigation (EMERCOM)
  - monitoring processes and events that can cause negative impacts on community, social infrastructure, natural complexes
  - data storage and analysis, information dissemination
  - organisation and implementation of prevention measures
  - rescue operations in case of emergencies
  - coordination of activities for preparing forecasts and scenarios
- Ministry of Health
  - monitoring factors influencing on health of the population
  - assessment of environmental conditions in urban areas

Figure36.: BS/USPMES



Multilevel structure of safety and risk management *(Vladimirov, V., 2000)*

In terms of risk assessment and management the most advanced subsystems of the USPMES are meteorological and seismological observations and forecast.

In practice the emphasis is made on health risk assessment and assessment of risks related to accidents.

At the Federal level risk assessment and management activities are supported by a number of approved methodologies. At regional and local levels these methodologies serves as a basis for development and implementation of appropriate guidelines and programmes.

Assessment of flood impact on households in the Volga Basin[27]

It is an interesting example from practice in cooperation between EMERCOM, NNSUACE and UNU/EHS. A survey was held in Nizhny Novgorod Oblast in 2005 and it covered households located at flood prone area. According to Emercom annually approximately several hundred households suffer from flooding and underflooding:

- Nizhny Novgorod city
- Balakhna district
- Bor district
- Semenovsky district Semenov (town)
- Shatkovsky district, Shatky (town)
- Pocinkovsky district, village Kochkurovo
- Buturlino district Buturlino (town)
- Voskresensky district, village Bolshiye Otary

Approximately 200 households were investigated (including 166 households located outside Nizhny Novgorod).

Conclusions:

- Emercom information about flood influence on households was confirmed in general, but in some cases flood influence was exaggerated (for instance in Balakhna district);
- Household level of income is lower than minimal living standards in Nizhny Novgorod province;
- Flood itself is considered by people as usual phenomena. They rarely feel discomfort about flooding. But they suffer from house and mortgage damages caused by flood;
- Household losses usually are identified in descriptive way without estimation of financial and moral losses;
- Local authorities care about people suffering from disaster was not detected;
- Insurance is rarely applied by poor households while more sustainable families usually purchase insurance programmes.

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[27] This Case study is based on EMERCOM information and on field survey of affected households

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3.3.3 The 2002 Flood in Europe: Lessons Learned

INWEB, Greece

Introduction

The extreme flood event in central Europe in August 2002 caused heavy damages and losses of human lives in Austria, the Czech Republic and in South-East Germany. The total flood losses are estimated at about 15 to 16 billion €. 100 people lost their lives and about 100.000 had to be displaced. The flood peak of the Elbe River in Dresden is classified as at least a 500 years flood. In Austria, it is estimated that the flood peak along the Danube River corresponds to a 70-100 years flood while in some tributary basins floods with a return period of about 1000 years and above can be assumed.

The objective of this overview is to summarise the experiences gained from the catastrophic flood of 2002, to re-analyse the flood management strategy and to discuss a “new” flood risk management approach.

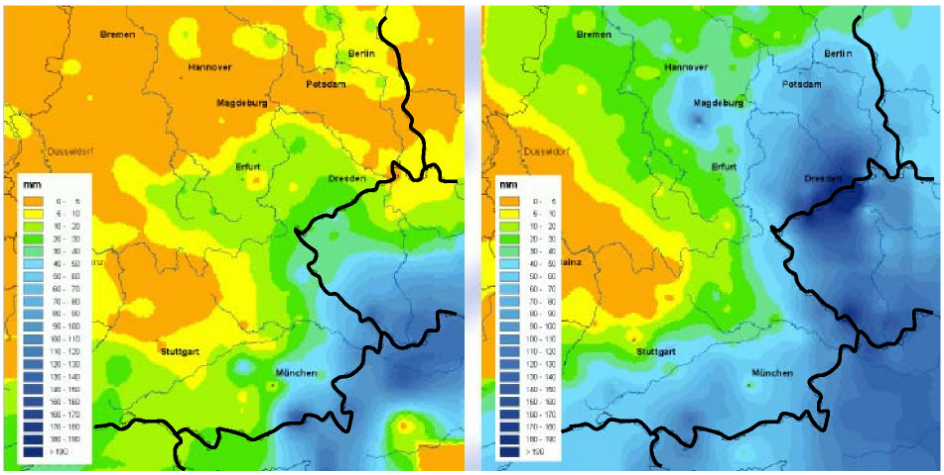
Results and impacts

In August 2002 a severe flood event occurred in Central Europe causing heavy damages especially in the Elbe and in parts of the Upper Danube river basin. The flood was caused by a so-called V-b atmospheric circulation pattern, a cyclone that developed in the Northern Mediterranean and moved northeast from Genoa to Austria, the Czech Republic, Slovakia, Poland and the Baltic countries.

At several stations the total rainfall amount within two days exceeded 150 mm and at others more than 200 mm (Fig. 1) which corresponds to about 150 % of the mean monthly rainfall in August. A few days later even higher rainfall intensities occurred centred over the mountain range between the the Czech Republic and Germany, and still producing intensive rainfall in Northern Austria *(Habersack, 2003)*.

In Northern Austria the total rainfall amount measured from August 6 until August 13 was about 3 to 4 times the long term monthly mean of August, and about 40-50% of the mean annual precipitation (*Steinacker, 2002)*.

Figure 37.: Amount of precipitation from 6-8 (left) and 10-13 August 2002 (right) (*Rudolf and Rapp, 2003*)



Major towns along the Danube River are protected against a 100 years flood, and the design values for the flood levees in the city of Vienna correspond to about a 10 000 years flood. Although there are problems in the statistics of extreme floods due to changes in the cross section and of the riverbed, it is estimated that the flood peak along the Danube River corresponds to a 70-100 years flood. Thus, the damages were not extraordinary in the Danube flood plain. In Dresden (Fig.2), where historical measurements go back to 1845, the maximum water level during the flood in August 2002 exceeded historical landmarks dating back to the 13th century. The flood peak is estimated of at least 500 years return period.

Figure 38.: Catchment of the Elbe (Landesumweltamt Brandenburg, 2002)

A quite different situation was found in some smaller tributaries draining the area between the Czech border and the Danube, where the extreme flood in 2002 exceeded by far all design values. The peak discharge in 2002 at the gauging station Zwettl at the Kamp River has been rated with a return period of between 500 and 2 000 years. All the historical data are substantially below the 2002 peak. Other smaller tributaries in the provinces of Upper and Lower Austria suffered similarly and large economic losses were finally identified.

The flood resulted in about 100 losses of life in central Europe and about 100 000 people had to be evacuated, especially in Prague and in some towns along the Elbe. The flood damages have been estimated at more than 9 billion € in Germany (*Becker and Grünewald, 2003*), about 3 billion € in the Czech Republic and about 3 billion € in Austria *(Stalzer, 2003*). Still, there are some uncertainties in the reported data but in any case it can be concluded that such flood damages have never been reported before in Europe

Lessons learned

Immediately after the flood the discussion about the causes of such an extraordinary and disastrous event started. Frequently raised arguments referred to:

- impacts of global warming and climate change,
- modified and intensified land use like urbanization and sealing of large areas in the basin,
- river engineering works like channelisation of rivers, and losses of the retention capacity in the basin due to flood protection measures like dykes.

Many uncertainties still remain on whether climate change could intensify the peak of floods in Central Europe. With respect to extremes in runoff it depends strongly on the originating process, if floods are caused by rainfall and/or snow melt, summer precipitation seems generally to decrease.

Direct human interventions in river basins are manifold. They include channelisation of rivers, losses in flood plains and retention capacity, increase of impervious surface of landscape, large changes in land use patterns and intensified land use, especially for the development of settlements. Due to the channelisation of rivers the velocity of flood

propagation is increased as is shown for the Austrian section of the Danube. In general, human interventions in developed countries have substantially modified river courses and the retention capacity of basins. The trend towards shorter flow times is obvious and very probably intensity of smaller and medium floods has increased. There is in general no evidence that extreme floods are modified because they overtop dykes and inundate their old flood plains, as it happened during the last flood in 2002. Most of these lessons are relevant to Russia and its Volga Basin, and in particular to flood control on small rivers of its basin.

Flood management and institutional reform

In a national workshop held in Vienna in March 2003 *(Nachtnebel, 2003),* meteorologists, hydrologists, engineers, regional planners, experts from the federal and provincial administration, and experts from insurance companies, institutions for civil protection and voluntary regional emergency teams discussed new strategies for flood risk management. The findings are briefly summarized as follows.

Need for reliable forecasts:

The maximum travel time for excess rainfall to pass through Austria is about 1 to 2 days. Obviously, the concentration time in smaller catchments ranges from hours to a day. To obtain longer hydrological forecast times a more reliable meteorological forecast is required to drive rainfall runoff models.

Early warning systems:

Warning started when first ground measurements became available. Some of the gauging stations in the basin and also some communication lines were destroyed by the flood and woody debris. This delayed somewhat the identification of the spatial impacts of the event and particularly the coordination of emergency teams. The communication across districts and provincial borders could be improved.

Disharmony in responsibilities:

Land development plans are in the responsibility of regional and local authorities while flood risk maps are elaborated at the provincial level, sometimes at the federal level. According to legal regulations housing areas have to be developed in regions that are not endangered by a 30 years, respectively 100 years flood. It was found that land development, especially the development of residential areas, does not follow these principles and often after the development of new housing estates the request for improved flood protection is raised which has to be mainly covered by federal and provincial resources.

Remediation measures:

Immediately after the flood the federal government to compensate quickly individuals for their losses established a disaster relief fund. Further, the provincial governments contributed and also different institutions collected substantial private donations. About 400 million € are contributed by the European Union. Compensation ranges from 30 to 60 % of the claimed damages. Until now there are some discrepancies between official statistics and privately raised complaints about the execution of compensations. It is understandable but not always rational to re-establish the status ex ante. This holds for dikes that are rebuilt just at the same location as it was and this holds for severely damages houses in the vicinity of the river course that are reconstructed although the place is obviously endangered by floods.

Public compensation and private insurance:

Provincial authorities execute compensation and therefore different practices may be applied in neighbouring villages that are only separated by an administrative border. The principle that someone can only be compensated once for his losses is logical but in some cases it happened that compensations from flood insurances were deducted from the governmental contribution.

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3.3.4 Institutional Framework for Natural Disasters Risk Reduction in Russia

EcoPolicy Research and Consulting, Russia

Introduction

A *natural disaster*, according to the UN ISDR, is the result of impact of a natural hazard on a socio-economic system with a given level of vulnerability, which prevents the affected society from coping adequately with the negative impacts of an extreme event; a disaster causes serious disruption in the functioning of a society, and results in human, material, or environmental looses.

According to existing Russian national standards (*GOST*) a natural disaster is a large-scale destructive natural hazard or a creeping natural process resulting in threats to life or human health, in destruction of material property, infrastructure and environment. Emergency is a situation when normal conditions for human existence and activities are breached, a threat to human lives and health, and damage to material property, economy and environment occur, and emergency responses aimed at risk reduction are required. Emergencies are classified according to their scale, i.e. transboundary (international), federal, regional, territorial and local. Usually, emergencies occur as a result of natural disasters, technological accidents and bio-medical disasters.

In 2004, according to official data of the Russian Federation Ministry of Civil Defense, Emergencies and Natural Disasters Mitigation (EMERCOM) there were a total of 1134 emergency situations in Russia, including 231 natural disasters. As a result of all

emergencies 2.459 people died that year, and 23.182 were affected[28] A relatively high proportion of deaths were caused by technological (and terrorist acts) rather than natural hazards, whereas the total number of people affected (16 475) is usually higher in natural disasters. For example, in 2004, about one percent of fatalities (27) associated with emergencies in Russia were caused by natural disasters. The main emergencies in Russia occurred in the Volga-Urals district (288), Siberian (201), and North-West (191).

Domestic Institutions for Natural Disasters Risk Reduction

National institutional framework for natural disasters risk reduction is quite well established in Russia. It has been under formation mainly during the last decade, and its major components include legislation, administrative structures, coordination mechanisms, national strategies and programmes, regimes for vertical subsidiarity, etc. Both its institutional design and its performance produce more advanced results in comparison with national institutional framework for environmental protection.

Administrative structure

The EMERCOM is a focal point in disaster risk reduction. It is the federal executive organ responsible for implementation of government policy on disaster risk reduction and for operational management and coordination of government actions in case of emergencies. During the last decade it demonstrated an active stance: it is one among few organs of the state authority in Russia which managed to acquire true respect from the public and simultaneously to gain its prestige among other government institutions. Unlike other agencies of the environmental block, that have been under constant reforming in the 1990s, the EMERCOM has a solid position in the governmental hierarchy.

The specifics of this agency are that not only natural disasters, but technological and bio-medical emergencies are within its competence. Its major goals include:

- Performance of state policy and measures to protect population and territories from emergencies; operational actions in case of emergencies
- Regulation and control in emergencies prevention and mitigation
- Management and coordination of federal executive authorities actions in disaster risk reduction
- Collection and processing of information for disaster risk reduction

EMERCOM vertical structure incorporates 6 regional centers (Central, North-West, North-Caucuses, Volga-Urals, Siberian, and Far-East); they coordinate their efforts in the regions with the disaster management bodies of 89 subjects of the Russian Federation. EMERCOM also supervises horizontal coordination of activities of various sectoral government agencies via special Interagency Commission for Emergencies Prevention and Mitigation.

Legislation

National legislation of the Russian Federation in disaster risk reduction consists of the main national framework law “On protection of population and territories from natural and technological emergencies”, 1994 and of a set of related federal legislation, directives, rules and normative acts. This federal law provides the legal basis for disaster emergency response, as well as prevention and mitigation efforts. It defines the

[28] Reliable methodologies for systematic damage assessment from natural emergencies and their negative human and ecological impacts across the country do not yet exist, and they are in a process of development; existing assessments are approximate in terms of affected persons and the extent of economic damage.

main notion of an emergency situation and emergency responses, and it determines the competence of government authorities and division of responsibilities between federal, regional levels and municipalities. This law sets rules for actions both of rescue teams and of the public in case of emergencies, as well as major directions on how to enhance disaster preparedness.

Institutional regime for natural disasters risk reduction established by this framework law is also developed in detail by a set of federal laws and acts regulating various aspects of disaster reduction, including laws on emergency situation, on rescue forces and on civil defense, on hydro-technical facilities as well as by codes on water, forestry, environment and others. The national legal system in this area is supplemented by laws and regulations enacted by the federation subjects. For example, in 2004 in eighty four regions 1227 regulations were adopted, including 59 laws of the federation subjects. Such Volga regions as Mary El, Vladimirskaya, Yaroslavskaya, Volgogradskaya and Nizhegorodskaya oblasts amended their regional laws on Protection of population and territories from technological and natural emergencies.

Institutions for Floods Risk Reduction

Floods risk reduction in Russia is an integral component of general institutional framework for natural disasters risk reduction. Although, floods are among the top items at the national disaster reduction agenda, there is no unified special institutional framework for floods risk reduction; elements of institutional regime for floods reduction are under development.

Currently, this institutional system has two major components. The *first*, consists of institutional arrangements for *preparedness*, *emergency* response and *recovery*. EMERCOM with its territorial branches all-over Russia is the main government institution dealing with floods in case of emergencies with the major focus on human security. Since the beginning of the 2000s much more attention is being paid to enhancing local public awareness and preparedness for floods.

The *second* component is floods *prevention* and *mitigation* (including structural and non-structural measures, i.e. hydro-engineering, control in settlements and urbanized areas, construction in flood prone areas, early disaster warnings, enhancing public awareness and participation, rational land-use, forestry, and others) and includes a broader set of institutions dealing with the risk of floods, environmental and water management. The major among them is the RF Ministry for Natural Resources with its Federal Agency for Water Resources (FAWR) established in 2004. Among other responsibilities it takes care for maintenance of hydro-technical facilities, their safe functioning during flood events, and for control over hydrological regimes in the river basins and artificial reservoirs (*Postanovlenye Pravitelstva N 169, 6.04.2004*). It has a vertical structure consisting of its territorial organs in various regions of Russia, i.e. Basin Water Management Administrations, BWU across the country.

Currently, the issue of interagency coordination for floods risk reduction is discussed in the government, as up to nowadays coordination is quite weak and a great deal of implementation failures occurred during disaster flood events. One of the approaches is to establish a coordination center (within FAWR) with the goal to combine several phases of floods risk reduction, i.e. prevention-preparedness-response-flood risk assessment.

Flood Risks in the Volga Basin

According to Emercom official data there were a total of twenty two natural disaster emergencies in 2004 in the Volga Basin, with more than a half of emergencies registered in the Middle Volga region.

Figure 39.: Natural and Technological Disasters and Human Vulnerability in Volga Basin, 2004

Volga Regions	Total Number of emergencies	Including,			Number of population affected	Number of fatalities
		Natural disasters	**Technological disasters**	**Bio-medical disasters**		
VOLGA BASIN	350	22	320	8	1618	762
Lower Volga	27	8	19	0	163	40
Middle Volga	248	13	231	4	1091	528
Upper Volga	75	1	70	4	364	194

Source: State Report on Protection of Population and Territories of the Russian Federation from Natural and Technological Emergencies in 2004. EMERCOM, Moscow, 2005

Major types of natural disasters that occur regularly in the Volga Basin and threaten human security include river floods and coastal flooding, severe storms, extreme snowfalls, forest and peat fires and associated haze, droughts and insect infestations. The number and frequency of extreme weather fluctuations and abnormal meteorological events (storms, heavy rainfall and snowfall, extreme summer and winter temperatures, droughts) resulting in emergencies has increased during the recent years thought the whole basin. For example, summer droughts (atmosphere and soil) are becoming more frequent in Central, Privolzsk and Southern districts where they negatively affect agricultural crops. In Povolzye emergencies caused by droughts are being regularly registered every two to three years. Wildfires are also becoming a serious problem. In 2000, about 101,000 cubic meters of timber were burned in forest fires in the basin, and some 9,100 ha were affected by wildfires.

Floods are among regularly occurring and destructive natural disasters in the Volga basin. Often, they result in severe social and economic damage to livelihoods, and require emergency evacuations and rehabilitation of affected livelihoods. They damage agricultural crops and disrupt infrastructure and economic potential. About 4.7 million people in the basin are reported potentially vulnerable to floods *(Shahramanyan 1998)*. High vulnerability to floods (with about one third of the total population of each region) is registered in Volgogradskaya and Yaroslavskaya oblasts, in Kalmykia, in Mary El, Bashkortostan republics, and in Komi-Permiatsky okruig. According to official data, in 2004 the damage from floods in the Volga basin accounted for 958 million rubles, or forty five percent of the national total (Fig. 41). As the Volga's flow is highly regulated by the system of dams and artificial reservoirs the major problem during the freshet and seasonal floods period is coordination of hydrological regimes through the entire basin, as well as control over the regularly occurring freshet floods on its tributes and small rivers[29]

Figure 40.: Damage from Floods in the Volga Basin, 2004

Regional Water Basin Administration	Damage, Million Rbls
West-Caspian	836.5
Moskovsko-0kskoe	2.5
Upper-Volga	1.1
Lower Volga	104.0
Kamskoe	13.6
Total RUSSIA	2 137.1

[29] According to the regional authorities the approximate pattern of floods during the recent century is as follows: 4 catastrophic floods, 10 medium floods, 9 thousand small floods.

Currently, the levels of local preparedness and protection in the flood prone regions of the basin are poor. Many settlements in the basin do not have the necessary engineering protection. Often, flood related emergencies occur because during recent years the number of violations of existing settlement and construction norms in the flood-prone areas has sharply increased: houses are built ignoring existing rules, regulations are not enforced and inspections are not regularly performed. Education of local population on how to prevent risk of floods and how to adapt to them is essential; unfortunately most of the population still relies heavily on "good luck" when facing flood disasters. Another problem is poor development of municipal inundation systems in the cities which is a significant cause for flooding in spring and during heavy seasonal rainfalls in the urbanized areas of the basin.

At the same time, most of the existing hydro-technical facilities in the basin are aged and worn out. Their technical conditions are critical, placing many settlements and territories along Volga under threat. About one third of dams and water reservoirs have been in operation for over thirty years and urgently need renovation. Hydro-technical facilities, for example, of the Moscow Canal are in operation over 65 years, of the Volga-Don canal - for about 50 years, the Volga-Kama - for about 35-40 years. Recent inspections indicated that 24% of hydro-technical facilities are of normal security level, 66% - are below it, while 8% are in unsatisfactory and 3% - in dangerous state. According to existing assessments, failure of hydro-technical facilities could result in large-scale flooding in Moscovskaya, Tverskaya, Yaroslavskaya, Kostromskaya, Ivanosskaya, Nizhegorodskaya oblasts.

Volga Basin: Institutions for Flood Risk Reduction

Administration

Currently, the EMERCOM is the leading government agency responsible for performance of policies and practical efforts for *emergency* flood risk reduction across Russia, including the regions of the Volga Basin. Horizontally, it coordinates its activities in the field with a number of government agencies[30]. Flood *prevention* is in the functions of the Federal Agency for Water Resources (FAWR) under the RF Ministry for Natural Resources.

EMERCOM has a territorial network of regional bodies responsible for emergencies management. In the Volga basin, its activities are performed through its territorial affiliations, i.e. centers for civil defense and emergencies located within districts – Privolzhsk-Urals, Central and North-West. In their turn, their activities are coordinated with the regional disaster management bodies - organs on emergencies under the executive authorities of all federation subjects of the Volga basin. Special Interagency commission is established to coordinate efforts of various stakeholders during seasonal floods in the Volga basin.

FAWR has its own territorial affiliations dealing with water issues and flood prevention in the Volga basin: it is realized through the system of four Basin Water Manageemnt Administrations, BWU (with departments in Volga federation subjects), including the *Upper-Volga*[31], the *Lower-Volga*[32], the *Kama*[33] and the *Moskva-Volga*[34] River Basin Administrations. It also supervises activities of federal government organizations (21) responsible for management of the Volga water reservoirs and Volga hydro-technical

[30] RF Ministry for Natural Resources, RF Ministry of agriculture, RF Ministry for Health and Social Welfare, RF Hydromet, Rosaviakosmos, Rostehnadzor and others.

[31] Departments in Vladimirskaya, Yaroslavskaya, Kostromskaya, Penza, Nizhegorodskaya oblasts and in Chuvash, Mary-El, Mordva republics.

[32] Departments in Astrakhan, Volgograd, Samara, Saratov, Ulianovsk, Orenburg oblasts and Tatarstan republic

[33] Departments in Kirov, Perm oblasts, and in Bashkortostan, Udmuirtya republics

[34] Departments in Moscow, Kaluiga, Ryazan, Orel, Smolensk, Tver, Tuila oblasts

facilities. Two major functions related to floods risk reduction is within the competence of FAWR institutions: 1) maintenance of hydro-technical facilities and 2) regulation of hydrological regimes in the basin and their coordination within the system of Volga water reservoirs.

According to existing national legislation it is in the competence of territorial government authorities in the Volga basin to elaborate their regional legislation in disaster risk reduction which complies with national laws. Also it is in their responsibility to maintain task forces for emergencies mitigation in the regions, perform rescue operations, provide funding and create permanent organs for disaster management within their territories.

Institutions in action

Regional networks for natural and technological disasters risk assessment and forecasting are established in the federation subjects of the Volga basin: territorial centers for monitoring and forecasting are functioning under EMERCOM umbrella. Basing on GIS technologies such centers build long-term, mid-term and operational forecasts of natural disasters for particular regions in the basin, and develop strategies for their mitigation.

Since recently more attention is paid to coordinate efforts of various stakeholders in this sector. Partnerships are being established since recently. For example, as current system of 25 Hydromet monitoring sites for the N.Novgorod oblast is insufficient, since recently, it is supplemented and combined with the data from monitoring devices established by large industrial companies and water-users along the river (RAO UES, Lukoil). Local emergency response organs are also using satellite information (from NNGASU laboratory) specially acquired during freshet floods and forest fires.

Interaction with the local public and enhancing public participation in flood risk reduction is still a weak component in existing institutional schemes not only in the Volga basin, but all-over Russia. New approaches aiming at developing this challenging direction are being introduced, and some practical actions had been undertaken in the regions. For example, recently special operational services were established in the regions so that population is able to use the “01” telephone line to get in touch with the professional stuff. Operational centers in Nizhegorodskaya oblast reported that the number of calls during flood events has increased several fold. It is planned that similar services would be introduced not only by the Volga federation subjects, but by the municipalities in the basin as well. Pilot systems of early warning of natural disasters are established in some regions of the North-West district. Among tools in disaster reduction is establishing by regions and municipalities a local early warning of population about forth-coming natural disasters which is underway in some regions. Enhancing public awareness is of growing importance: Nizhegorodsky emergency center is involved in preparing local weekly TV-programmes ‘Safety School’. Every spring it also disseminates to local livelihoods the flyers with advice on how to behave during floods.

For particular regions of the Volga basin the EMERCOM (through its territorial organs) has developed schemes for evacuation of population in emergencies; they are incorporated as important elements in the national action plan for emergencies reduction. Such regional schemes are developed for Tatarstan, Mordva republic, Orel, Ryazan, Smolensk, Ulianovsk, Kaluiga oblasts and some other regions of the basin. Another important direction of practical activities in the regions is the unified all-Russian system of rescue forces under EMERCOM. It includes rescue forces in the regional rescue centers in the Volga Basin (North-West, Central and Privolzsk-Urals) as well as rescue units in 16 Volga cities. It is coordinated and supplemented by rescue teams under various ministries that are specializing on particular types of emergencies, including medical units of the health ministry, teams on animal and plants protection under the agricultural ministry, aviation teams for forests protection under the natural resources agency.

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D2 Report Abbreviations

COD – Chemical Oxygen Demand

MAC – Maximum Allowable Concentration

BOD – Biological Oxygen Demand

OECD – Organization for Economic Cooperation and Development

RF – Russian Federation

DOC – Dissolved Organic Carbon

NNSUACE – Nizhny Novgorod State University of Architecture and Civil Engineering

UNESCO – United Nations Educational, Scientific and Cultural Organization

GRP – Gross Regional Product

VAZ – Volzhsky Automobile Plant (after Russian abbreviation)

GAZ – Gorky Automobile Plant (after Russian abbreviation)

RAO EES – United Electrical Network (after Russian abbreviation)

PPF – Pulp and Paper Factory

EMERCOM – Russian Federal Ministry for Civil Defence, Emergencies and Natural Disasters Mitigation

NGO – Non-Governmental Organization

WFD – Water Framework Directive

EU – European Union

EC – European Commission

GIS – Geo-Information System

PSFF – Transitional Plan for Fluvial Areas

PSE – Transitional Plan for Control of Eutrophication

EMAS – Eco-Management and Audit Scheme

ISO – International Standard Organization

IFRM – Integrated Flood Risk Management

IPCC – Intergovernmental Panel on Climate Change

CRED – Center for Research on the Epidemiology of Disasters

EEA – European Environment Agency

UNDP – United Nations Development Programme

DKKV – German Committee for Disaster Reduction (after German abbreviation)

USPMES – Uniform State System for Prevention and Mitigation of Emergency Situations

MNR – Ministry of Natural Resources

EG – Expert Group

FAWR – Federal Agency for Water Resources

BWU – Basin Water Management Administration (after Russian abbreviation)
UDWS – Unified Deep Water System
UNECE – United Nations Economic Commission for Europe
ECMT – European Conference of Ministers of Transport
TACIS – Technical Assistance for the Commonwealth of Independent States
ELTIS – European Local Transport Information Service
WCZ – Water Conservation Zone
SDW – Solid Domestic Wastes